



University of Hawaii at Manoa

Hawaii Natural Energy Institute

Holmes Hall 246 • 2540 Dole Street • Honolulu, Hawaii 96822

January 31, 1991

Mr. Norman Hayashi
Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

DIV. OF WATER &
LAND DEVELOPMENT

91 FEB 5 3:52

RECEIVED

Dear Mr. Hayashi:

As required in the County of Hawaii Planning Commission's geothermal resources permit (GRP 89-1), five (5) copies of the October - December, 1990 quarterly report are enclosed

If you have any questions, please call me at 522-5620.

Sincerely,

Harry Olson
Hawaiian Electric Industries/
Spark Matsunaga Fellow in
Geothermal Energy Research

Enclosure: October-December quarterly report

OCTOBER - DECEMBER 1990 QUARTERLY REPORT

Scientific Observation Hole (SOH) Program

Geothermal Resource Permit: GRP 89-1

Lilewa, Kapoho, and Halekamahina, Hawaii

TMK: 1-2-10:01; 1-4-01:02; and 1-4-02:32

Hawaii Natural Energy Institute

University of Hawaii

January 1991

I. SUMMARY

This document presents a quarterly report to the County of Hawaii Planning Department to support the Scientific Observation Hole (SOH) program in the Kilauea middle and lower east rift zones. The SOHs are for scientific observation purposes only. The holes will not be flow-tested or produced. The information to be gained from the SOHs will provide an assessment of subsurface geological conditions, groundwater level and composition, temperature, drilling conditions, an inventory of possible mineral and geothermal resources, and an eruptive history of the island to the the depth drilled.

This report addresses: description of work under taken and planned; results of the enviromental and noise monitoring activities; log of complaints; status of exploration activities; other information; and financial accounting.

II. INTRODUCTION

The County of Hawaii Planning Commission approved, on August 8, 1989, a geothermal resource permit application (GRP 89-1) to drill scientific observation Holes (SOHs) in the Kilauea middle and lower east rift zone. This document presents a quarterly report, as required in Condition 11:

"The petitioner shall submit five (5) copies of a status report to the Planning Department on a quarterly basis (by the first day of January, April, July, and October of each year), or, within 30 days of the completion of any SOH. The status report shall include, but not limited to:

- a. A detailed description of the work undertaken during the current reporting period including drilling activity report;
- b. A description of the work being proposed over the next reporting period;
- c. The results of the environmental/noise monitoring activities;
- d. A log of the complaints received and the responses thereto;
- e. The current status of exploration activities in the context of long-range program goals; and
- f. Any other information that the Planning Department may require which will address environmental and regulatory

concerns involving the requirements of the Geothermal Resources Permit.

- g. This condition shall remain in effect until all of the conditions of approval have been complied with, then after which these reports shall be every six (6) months for the duration of the project.
- h. These reports shall include a financial accounting of the resources expended by the project."

III. BACKGROUND

The SOHs are for scientific observation purposes only. The holes will not be flow-tested or produced. As designated, four holes are planned to be drilled along the Kilauea East Rift Zone on the Big Island of Hawaii. Three of the Big Island holes (SOHs 1, 2, and 4) are on agriculture land and have been permitted by the County of Hawaii Planning Commission. The fourth hole, designated SOH 3, is on conservation land. SOH activities under Conservation District Use Permit (HA 12/20/85 - 1830) issued to the Estate of James Campbell have been approved.

IV. SOH 1 SITE

Description of Current Work

Tonto drilling services commenced drilling activities at 3:00 pm on Thursday, May 31, 1990. Drilling of SOH 1 proceeded smoothly during the coring, opening of the hole, and the

cementing of the casing to a depth of 1996 feet. The drilling penetration rate and bit life were extremely low below the casing due to difficult drilling conditions, including highly fractured rock, caving problems and core barrel blockage. The drilling penetration rate improved below 4,800 feet, reflecting an increased rock competency. Core drilling continued to a total depth of 5,526 feet as of December 23, 1990, when the hole was bottomed and operations were shut down for the Christmas break. A security service was engaged to monitor the site while the crew was on vacation.

Description of Proposed Work

After the Tonto Drilling Services crew returns from the Mainland for the Christmas break, the hole will be conditioned to the total depth and various logs (i.e. temperature, pressure, electrical, geophysical, etc.) will be conducted in the hole before the installation of the tubing. Following the completion of the logging, a high pressure wellhead valve will be welded to the casing, the wellpad fenced and secured. The mud and cuttings in the sump pit will be disposed in a manner recommended by the Department of Health.

Results of the Environmental/Noise Monitoring Activities

Passive hydrogen sulfide (H₂S) monitors were installed around located around the SOH 1 drill site. The Colortek sensors are replaced weekly as a matter of routine. No H₂S emissions

were detected during this reporting period.

The air quality monitoring station provides a continuous record of atmospheric H₂S concentrations when interfaced with a data logger or chart recorder. The unit is located in a utility container on-site and power is provided by the drill rig system.

Continuous wind speed and direction measurements were made with a recording wind speed/direction sensor system. A data logger and back-up pressure-sensitive recorder collects the wind speed and direction data. The unit is located in a utility container on-site and power is provided by the drill rig system.

One noise monitoring station is located at the SOH 1 site during drilling. A second noise station is located at the Laughlin residence, about a quarter mile west of the SOH 1 drill site. A third noise monitoring station is installed at the Pommerenk residence, about a mile east of the SOH 1 site. Due to the lack of AC power on-site, the monitor at the Pommerenk's is powered by solar charged batteries. To protect the monitor from the elements, a weather/security box has been built and installed. Technical problems occurred this reporting period due to problems with the chart recorders (i.e. the pens drying up and insect infestation).

Complaint Log and Response

Some noise complaints, primarily from the Pommerenks, were received during this reporting period. See Appendix B for

complaint notice and response. The noise consultant analysis reports for these complaints are in Appendix C, and show that SOH 1 drilling operations were within conditions set forth by the Geothermal Resource Permit (GRP 89-1).

V. SOH 2 SITE

Description of Current Work

No drilling activity has been initiated. Ambient noise monitoring is being prepared for the SOH 2 site. Findings of the flora/fauna field surveys have been sent to County of Hawaii Planning Department. A permit (3801-01) has been granted by the Department of Land and Natural Resources to inspect, modify, and if practical, install a pump into an existing airstrip well to supply water for drilling operations. The start-of-construction date for the assessment of the well has been extended from October 25, 1990 to April 25, 1991. A grading and grubbing permit for this site was granted on December 4, 1990.

Description of Proposed Work

Grading and grubbing work for the access road and drill site will be done, prior to any drilling. The airstrip well will be inspected to determine if it is feasible to pump water for drilling operations, and if so will be conditioned and a water pump installed. Ambient noise surveys will be conducted prior to any drilling activity.

Results of the Environmental/Noise Monitoring Activities

No drilling activity has been initiated. Ambient noise will be recorded prior to the commencement of drilling. Ambient noise levels will be recorded at, or near the homes of cooperating residents which may experience similar sound reception conditions with respect to noise sources at the drilling site.

Complaint Log and Response

Drilling activity has not been initiated. No complaints were received during this reporting period.

VI. SOH 3 SITE

Description of Current Work

Drilling activity has not been initiated. Access to the SOH 3 site has not been constructed, nor has the site been cleared or graded. SOH 3 is scheduled to be located at the True/Mid-Pacific alternate Drill Site 2 (approximately 3,000 feet north-north-west of the present drill site). All necessary reports have been submitted to DLNR for review and approval. DLNR has responded by asking for an expanded archaeological survey, which will be completed during 1991 prior to any activities at the site.

VII. SOH 4 SITE

Drilling Activity

Tonto Drilling Services completed drilling work at SOH 4 on May 21, 1990. No drilling activity was performed during this period. County of Hawaii landfill officials found the mud pit material unsuitable (too wet) for disposal at County waste sites; therefore, Department of Health officials have given approval to bury the material on-site. A six foot fence has been erected around the wellhead.

Description of Proposed Work

Various logs (i.e. temperature, pressure, and injection) will be conducted in the hole on a periodic basis. The mud and cuttings in the sump pit will be buried on-site and the site will be replanted with ohia seedlings.

Results of the Environmental/Noise Monitoring Activities

Air Quality, Meteorological, Noise and Emissions are not being monitored, since drilling has been completed at this site.

Complaint Log and Response

Drilling completed -- no activity for this activity.

VIII. STATUS OF CURRENT EXPLORATION ACTIVITIES

No activities are being pursued at this time, other than drilling at SOH 1 and permit activities at SOH 3 and SOH 2.

IX. OTHER INFORMATION

No concerns need to be addressed at this time.

X. FINANCIAL REPORT

See Appendix D for Budget status.

APPENDIX A
DAILY DRILLING REPORTS -- SOH 1

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 9-30-90
 Period End 0700 10-01-90
 Depth Start 3346 ft.
 Depth End 3377 ft.
 Footage 31
 Mud Wt 8.4
 Mud Vis IN 43 OUT 39
 Mud pH 10
 Mud Temp(F):IN 77 OUT N/A
 LC. @ _____

Bits: _____

Date 10-01-90
 Spud Date 06-01-90
 Day # 123
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Cunningham
 Helper K.M.
 Helper J.K.
 Night Shift-
 Driller LaOrange
 Helper K.K.
 Helper K.L.
 Foreman Cunningham
 Drilling Mgr Wicklund

Additional Information: CORING FROM 3346 TO 3377 FEET WITH HQ
(31 FT). WATER TEMPERATURE AT 3364 FEET 106⁰(F). WIRELINE
CABLE BROKE AND HAD TO TRIP DRILL PIPE. CHANGED DRILL BIT AT
3364 FEET (1 1/2 FEET CAVE IN HOLE).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>		
<u>134mm</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>4.0"</u>	<u>0 to 3377</u>		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10-01-90
 Period End 0700 10-02-90
 Depth Start 3377 ft.
 Depth End 3402 ft.
 Footage 25
 Mud Wt 8.4
 Mud Vis 38
 Mud pH 9
 Mud Temp(F):IN 76 OUT N/A
 LC. @ _____
 Bits: 1-HQ Bit #L63208

Date 10-02-90
 Spud Date 06-01-90
 Day # 124
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Cunningham
 Helper K.M.
 Helper J.K.
 Night Shift-
 Driller LaOrange
 Helper K.K.
 Helper K.L.
 Foreman Cunningham
 Drilling Mgr Wicklund

Additional Information: DRILL HQ WIRELINE FROM 3377 TO 3402
FEET (25 FT). ROCK BROKEN (GRAVEL). LOST CIRCULATION, BUT
CAME BACK ON ITS OWN. TRIP FOR NEW BIT. 1 1/2 FEET OF CAVE
IN BOTTOM OF HOLE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>		
<u>134mm</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>4.0"</u>	<u>0 to 3402</u>		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10-02-90
 Period End 0700 10-03-90
 Depth Start 3402 ft.
 Depth End 3422 ft.
 Footage 20
 Mud Wt 8.4
 Mud Vis 42
 Mud pH 9.5
 Mud Temp(F):IN 77 OUT N/A
 LC. @ _____
 Bits: 1-HQ Bit #15648-10

Date 10-03-90
 Spud Date 06-01-90
 Day # 125
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Cunningham
 Helper J.K.
 Helper K.M.
 Night Shift-
 Driller LaOrange
 Helper K.K.
 Helper K.L.
 Foreman Cunningham
 Drilling Mgr Wicklund

Additional Information: CORING WITH HOWL FROM 3402 TO 3422
FEET (20 FT). TRIP DRILL PIPE FOR NEW BIT AT 3414 FEET.
ONE FOOT OF CAVE IN BOTTOM OF HOLE. STILL DRILLING FRACTURED
GRAVELLY TYPE FORMATION. SURVEY SHOWS HOLE OFF 2 1/2 DEGREES
AND AZMUTH AT SOUTH 40° WEST AT 3400 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>		
<u>134mm</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>4.0"</u>	<u>0 to 3422</u>		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # <u>SOH-1</u>	Date <u>10-04-90</u>
Period Start <u>0700 10-03-90</u>	Spud Date <u>06-01-90</u>
Period End <u>0700 10-04-90</u>	Day # <u>126</u>
Depth Start <u>3422 ft.</u>	Contractor/Rig <u>Tonto/U-5000</u>
Depth End <u>3462 ft.</u>	Day Shift- _____
Footage <u>40</u>	Driller <u>Cunningham</u>
Mud Wt <u>8.4</u>	Helper <u>K.M.</u>
Mud Vis <u>39</u>	Helper <u>J.K.</u>
Mud pH <u>9</u>	Night Shift- _____
Mud Temp(F): IN <u>77</u> OUT _____	Driller <u>LaOrange</u>
LC. @ _____	Helper <u>K.K.</u>
Bits: _____	Helper <u>K.L.</u>
_____	Foreman <u>Cunningham</u>
_____	Drilling Mgr <u>Wicklund</u>

Additional Information: DRILLING AHEAD WITH HOWL FROM 3422 TO 3462 FEET (40 FT). ROCK MORE COMPETENT FOR THIS INTERVAL. BOTTOM HOLE TEMPERATURE AT 3438 FEET 111⁰(F).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>	_____	_____
<u>134mm</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>4.0"</u>	<u>0 to 3462</u>	_____	_____

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10-04-90
 Period End 0700 10-05-90
 Depth Start 3462 ft.
 Depth End 3498 ft.
 Footage 36
 Mud Wt 8.4
 Mud Vis IN:46 OUT:33
 Mud pH 10
 Mud Temp(F):IN 76 OUT 83
 LC. @ _____
 Bits: _____

Date 10-05-90
 Spud Date 06-01-90
 Day # 127
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Cunningham
 Helper J.K.
 Helper K.M.
 Night Shift-
 Driller LaOrange
 Helper K.K.
 Helper K.L.
 Foreman Cunningham
 Drilling Mgr Wicklund

Additional Information: CORING WITH HQWL FROM 3462 TO 3498 FEET
(36 FT). ROCK HARD AND BROKEN. BOTTOM HOLE TEMPERATURE AT 3492
FEET 110⁰(F).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>		
<u>134mm</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>HQWL</u>	<u>0 to 3462</u>		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10-05-90
 Period End 0700 10-06-90
 Depth Start 3498 ft.
 Depth End 3512 ft.
 Footage 14
 Mud Wt 8.4
 Mud Vis IN:44 OUT:40
 Mud pH 10
 Mud Temp(F):IN 76 OUT 83
 LC. @ _____

Bits: HQ #L70388 @ 3,510 ft
HQ #M564-24 @3,512 ft

Date 10-06-90
 Spud Date 06-01-90
 Day # 128
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Cunningham
 Helper J.K.
 Helper K.M.
 Night Shift-
 Driller LaOrange
 Helper K.K.
 Helper K.L.
 Foreman Cunningham
 Drilling Mgr Deymonaz

Additional Information: DRILLING AHEAD WITH HQ FROM 3,498 TO 3,512 FEET. REPLACED CORE DUE TO EXCESSIVE WEAR FROM ABRASIVE FORMATION. TRIPPED DRILL RODS TWICE FOR BIT CHANGE. 4 FEET OF CAVE ON BIT CHANGE AT 3,512 FT. FORMATION INTERMITTENTLY SANDY, FRACTURED AND ABRASIVE. 90 - 95% RETURNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>	<u>(See below)</u>	
<u>5 1/4"</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>4"</u>	<u>3022 to 3512</u>	<u>N/A</u>	<u>N/A</u>

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10-06-90
 Period End 0700 10-07-90
 Depth Start 3512 ft.
 Depth End 3538 ft.
 Footage 26
 Mud Wt 8.4
 Mud Vis IN:46 OUT:44
 Mud pH 10
 Mud Temp(F):IN 77 OUT 84
 LC. @ _____
 Bits: HQ #L68515 @ 3,538 ft

Date 10-07-90
 Spud Date 06-01-90
 Day # 129
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Cunningham
 Helper J.K.
 Helper K.M.
 Night Shift-
 Driller LaOrange
 Helper K.K.
 Helper K.L.
 Foreman Cunningham
 Drilling Mgr Deymonaz

Additional Information: DRILLING AHEAD WITH HQ FROM 3,512 TO 3,538 FEET. TRIPPED DRILL RODS FOR BIT CHANGE. ONE FOOT OF CAVE ON BIT CHANGE. FORMATION INTERMITTENTLY SANDY, FRACTURED AND ABRASIVE. 90 - 95% RETURNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>	<u>(See below)</u>	
<u>5 1/4"</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>4"</u>	<u>3022 to 3538</u>	<u>N/A</u>	<u>N/A</u>

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10-07-90
 Period End 0700 10-08-90
 Depth Start 3538 ft.
 Depth End 3550 ft.
 Footage 12
 Mud Wt 8.4
 Mud Vis IN:44 OUT:42
 Mud pH 10
 Mud Temp(F):IN 77 OUT 84
 LC. @ _____
 Bits: HQ #M63564-11 @ 3,541

Date 10-08-90
 Spud Date 06-01-90
 Day # 130
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Cunningham
 Helper J.K.
 Helper K.M.
 Night Shift-
 Driller LaOrange
 Helper K.K.
 Helper K.L.
 Foreman Cunningham
 Drilling Mgr Deymonaz

Additional Information: DRILLING AHEAD WITH HQ FROM 3,538 TO 3,550 FEET. TRIPPED DRILL RODS FOR BIT CHANGE AT 3,541 FEET. ONLY 0.3 FT. OF RECOVERY IN 12 FT. INTERVAL DRILLED AND BARREL PLUGGING OFF CAUSING SHORT RUNS (6 in 12 ft.), HOLE REMAINING CLEAN TO BOTTOM ON 4 RUNS BELOW 3,541 FT. 90 - 95% RETURNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
<u>12 1/4"</u>	<u>0 to 202</u>	<u>9-5/8" (0-202)</u>	<u>K-55/40#</u>
<u>8 1/2"</u>	<u>202 to 1996</u>	<u>7" (0-1996)</u>	<u>L-80/35#</u>
<u>5 7/8"</u>	<u>1996 to 2671</u>	<u>(See below)</u>	
<u>5 1/4"</u>	<u>2671 to 3022</u>	<u>4 1/2" (0-3022)</u>	<u>J-55/10.5#</u>
<u>4"</u>	<u>3022 to 3550</u>	<u>N/A</u>	<u>N/A</u>

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole #	SOH-1
Period Start	0700 10/08/90
Period End	0700 10/09/90
Depth Start	3,550 ft.
Depth End	3,565 ft.
Footage	15 ft.
Mud Wt	8.4 #/gal
Mud Vis	IN: 43 OUT: 41
Mud pH	9.5
Mud Temp (F):	IN: 75 OUT: 81
LC. @	
Bits:	HQ #7194-2 @ 3,550 ft.

Date	10/09/90
Spud Date	06/01/90
Day #	131
Contractor/Rig	Tonto/U-5000
Day Shift-	
Driller	Fierback
Helper	J.K.
Helper	
Night Shift -	
Driller	Cunningham
Helper	K.M.
Helper	R.O.
Foreman	Fierback
Drilling Mgr	Deymonaz

Additional Information: Drilling ahead with HQ from 3,550-3,565 feet. Formation highly fractured causing short run with poor core recovery, 4 foot recovered in last 15 feet. Except for temporary loss of circulation at 3,562 feet, fluid returns at 95%. Bottom hole temperature at 3,564 ft.: 110F.

History

Hole Size	Interval (ft)		Casing Size (interval)	Grade/Weight
12 1/4"	0	to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202	to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996	to 2,671	(See below)	
5 1/4"	2,671	to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022	to 3,565	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole #	SOH-1
Period Start	0700 10/09/90
Period End	0700 10/10/90
Depth Start	3,565 ft.
Depth End	3,590 ft.
Footage	25 ft.
Mud Wt	8.4 #/gal
Mud Vis	IN: 47 OUT: 45
Mud pH	9.0
Mud Temp (F):	IN: 77 OUT: 84
LC. @	
Bits:	HQ #X9-956 @ 3,565 ft.

Date	10/10/90
Spud Date	06/01/90
Day #	132
Contractor/Rig	Tonto/U-5000
Day Shift-	
Driller	Fierback
Helper	J.K.
Helper	K.L.
Night Shift -	
Driller	Cunningham
Helper	K.M.
Helper	R.O.
Foreman	Fierback
Drilling Mgr	Deymonaz

Additional Information: Drilling ahead with HQ from 3,565 - 3,590 feet. Tripped drill rods for bit change, washed rods last 30 ft. to bottom. Core recovery increasing to about 90% in less brecciated dike rock.

History

Hole Size	Interval (ft)		Casing Size (interval)	Grade/Weight
12 1/4"	0	to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202	to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996	to 2,671	(See below)	
5 1/4"	2,671	to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022	to 3,590	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10/10/90
 Period End 0700 10/11/90
 Depth Start 3,590 ft.
 Depth End 3,625 ft.
 Footage 35 ft.
 Mud Wt 8.4 #/gal
 Mud Vis IN: 43 OUT: 41
 Mud pH 9.5
 Mud Temp (F): IN: 76 OUT: 82
 LC. @ _____
 Bits: _____

Date 10/11/90
 Spud Date 06/01/90
 Day # 133
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Fierback
 Helper J. K.
 Helper K.L.
 Night Shift -
 Driller Cunningham
 Helper K.M.
 Helper R.O.
 Foreman Fierback
 Drilling Mgr Deymonaz

Additional Information: Drilling ahead with HQ from 3,590 - 3,625 feet. Formation includes bedded sands and clay, brecciated materials and dikes.

History

Hole Size	Interval (ft)		Casing Size (interval)	Grade/Weight
12 1/4"	0	to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202	to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996	to 2,671	(See below)	
5 1/4"	2,671	to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022	to 3,625	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10/11/90
 Period End 0700 10/12/90
 Depth Start 3,625 ft.
 Depth End 3,660 ft.
 Footage 35 ft.
 Mud Wt 8.4 #/gal
 Mud Vis IN: 44 OUT: 42
 Mud pH 9.0
 Mud Temp (F): IN: 76 OUT: 82
 LC. @

Bits: HQ #68474 @ 3,625 ft.

Date 10/12/90
 Spud Date 06/01/90
 Day # 134
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Fierback
 Helper J.K.
 Helper K.L.
 Night Shift -
 Driller Cunningham
 Helper K.M.
 Helper R.O.
 Foreman Fierback
 Drilling Mgr Deymonaz

Additional Information: Drilling ahead with HQ from 3,625 - 3,660 feet. Tripped drill rods for bit change at 3,625 ft., hole clean to bottom. Core recovery remaining at about 90% with fluid returns at about 95%.

History

Hole Size	Interval (ft)		Casing Size (interval)	Grade/Weight
12 1/4"	0	to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202	to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996	to 2,671	(See below)	
5 1/4"	2,671	to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022	to 3,660	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start 0700 10/12/90
 Period End 0700 10/13/90
 Depth Start 3,660 ft.
 Depth End 3,716 ft.
 Footage 56 ft.
 Mud Wt 8.4 #/gal
 Mud Vis IN: 48 OUT: 42
 Mud pH 9.0
 Mud Temp (F): IN: 75 OUT: 82
 LC. @ _____
 Bits: _____

Date 10/13/90
 Spud Date 06/01/90
 Day # 135
 Contractor/Rig Tonto/U-5000
 Day Shift-
 Driller Fierback
 Helper J.K.
 Helper K.L.
 Night Shift -
 Driller Cunningham
 Helper K.M.
 Helper R.O.
 Foreman Fierback
 Drilling Mgr Deymonaz

Additional Information: Drilling ahead with HQ from 3,660 - 3,716 feet. In submarine sequence below 3,600 feet, including submarine flows, dikes and minor clastic materials. Bottom hole temperature at 3,706 ft.: 130F.

History

Hole Size	Interval (ft)		Casing Size (interval)	Grade/Weight
12 1/4"	0	to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202	to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996	to 2,671	(See below)	
5 1/4"	2,671	to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022	to 3,716	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole #	SOH-1
Period Start	0700 10/13/90
Period End	0700 10/14/90
Depth Start	3,716 ft.
Depth End	3,775 ft.
Footage	59 ft.
Mud Wt	8.4 #/gal
Mud Vis	IN: 44 OUT: 38
Mud pH	9.0
Mud Temp (F):	IN: 75 OUT: 82
LC. @	
Bits:	HQ #19993-8 @3,732 ft.

Date	10/14/90
Spud Date	06/01/90
Day #	136
Contractor/Rig	Tonto/U-5000
Day Shift-	
Driller	Fierback
Helper	J.K.
Helper	K.L.
Night Shift -	
Driller	Cunningham
Helper	K.M.
Helper	R.O.
Foreman	Fierback
Drilling Mgr	Deymonaz

Additional Information: Drilling ahead with HQ from 3,716 - 3,775 feet. Tripped drill rods for bit change at 3,732 ft. Bottom hole temperature @ 3,775 feet: 134 ft.

History

Hole Size	Interval (ft)		Casing Size (interval)	Grade/Weight
12 1/4"	0	to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202	to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996	to 2,671	(See below)	
5 1/4"	2,671	to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022	to 3,775	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole #	SOH-1
Period Start	0700 10/14/90
Period End	0700 10/15/90
Depth Start	3,775 ft.
Depth End	3,844 ft.
Footage	69 ft.
Mud Wt	8.4 #/gal
Mud Vis	IN: 45 OUT: 38
Mud pH	9.0
Mud Temp (F):	IN: 74 OUT: 81
LC. @	
Bits:	

Date	10/15/90
Spud Date	06/01/90
Day #	137
Contractor/Rig	Tonto/U-5000
Day Shift-	
Driller	Fierback
Helper	J.K.
Helper	K.L.
Night Shift -	
Driller	Cunningham
Helper	K.M.
Helper	R.O.
Foreman	Fierback
Drilling Mgr	Deymonaz

Additional Information: Drilling ahead with HQ from 3,775 - 3,844 feet. Bottom hole temperature @ 3,834 feet: 138 F. Fluid circulation 95%, core recovery 100%.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 3,844	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole #	SOH-1
Period Start	0700 10/15/90
Period End	0700 10/16/90
Depth Start	3,844 ft.
Depth End	3,870 ft.
Footage	26 ft.
Mud Wt	8.4 #/gal
Mud Vis	IN: 44 OUT: 38
Mud pH	9.0
Mud Temp (F):	IN: 75 OUT: 82
LC. @	
Bits:	

Date	10/16/90
Spud Date	06/01/90
Day #	138
Contractor/Rig	Tonto/U-5000
Day Shift-	
Driller	Fierback
Helper	J.K.
Helper	K.L.
Night Shift -	
Driller	Cunningham
Helper	K.M.
Helper	R.O.
Foreman	Fierback
Drilling Mgr	Deymonaz

Additional Information: Drilling ahead with HQ from 3,844 - 3,870 feet. Drilling in fractured dike rock, pervasively fractured resulting in short runs (2 - 4 ft.) and several hours spent tripping drill rods to remove dropped core.

History

Hole Size	Interval (ft)		Casing Size (interval)	Grade/Weight
12 1/4"	0	to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202	to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996	to 2,671	(See below)	
5 1/4"	2,671	to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022	to 3,870	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole #	SOH-1
Period Start	0700 10/16/90
Period End	0700 10/17/90
Depth Start	3,870 ft.
Depth End	3,892 ft.
Footage	22 ft.
Mud Wt	8.4 #/gal
Mud Vis	IN: 44 OUT: 39
Mud pH	9.0
Mud Temp (F):	IN: 76 OUT: 81
LC. @	3,872 - 3,880 ft.
Bits:	HQ #20180-3 @ 3,872 ft. (146 ft. cut)

Date	10/17/90
Spud Date	06/01/90
Day #	139
Contractor/Rig	Tonto/U-5000
Day Shift-	
Driller	Fierback
Helper	J.K.
Helper	K.L.
Night Shift -	
Driller	Cunningham
Helper	K.M.
Helper	R.O.
Foreman	Fierback
Drilling Mgr	Deymonaz

Additional Information: Drilling ahead with HQ from 3,870 - 3,892 feet. Drilling in dikes and minor submarine flows, dike material very broken resulting in short runs (1 - 5 feet). Tripped drill rods for bit change at 3,872 ft. Total loss circulation and possible large fracture at 3,872 ft., regained circulation at 3,878 feet and remaining at about 90%. Bottom hole temperature @ 3,892 feet: 126 F, depressed temperature probably resulting from nearby loss circulation zone.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 3,892	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 10/17/90
Period End: 0700 10/18/90
Depth Start: 3,892 ft.
Depth End: 3,920 ft.
Footage: 28 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 82
LC @

Date: 10-18-90
Spud Date: 06-01-90
Day #: 140
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Fierback
Helper: J.K.
Helper: K.K.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Drilling ahead with HQ from 3,892.-3,920 feet. Drilling in fractured dike rock and minor submarine volcanics. Fractured dike rock causing numerous short core runs, slowing progress. Condition bottom 100 feet of hole and prepare to trip. First anhydrite mineralization noted in fractures and voids at 3,920 ft.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 3,920	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 10/18/90
Period End: 0700 10/19/90
Depth Start: 3,920 ft.
Depth End: 3,934 ft.
Footage: 14 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 45 in 39 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 81
LC @ 3,922 ft. lost 4 bbls.

Date: 10-19-90
Spud Date: 06-01-90
Day #: 141
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Fierback
Helper: J.K.
Helper: K.L.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits: HQ #20180-6 @ 3,922 ft.

Additional Information: Trip rods for bit change at 3,922 ft., had to ream last 4 feet into hole, temp. total loss of circulation as bit reached bottom of hole, approx 4 bbl. lost before regaining full returns. Drilling ahead with HQ from 3,922 - 3,934 feet. Drilling in dikes and minor submarine flows, dike material very broken resulting in short runs (1 - 5 feet).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 3,934	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # 90H-1
 Period Start: 0700 10/19/90
 Period End: 0700 10/20/90
 Depth Start: 3,934 ft.
 Depth End: 3,976 ft.
 Footage: 42 ft.
 Mud Wt: 8.4 #/gal
 Vis (sec): 44 in 39 out
 Mud pH: 9.0
 Mud Temp (F): IN 75 OUT 82
 LC @ 3,970 & 3,975, temp. total loss

Date: 10-20-90
 Spud Date: 06-01-90
 Day #: 142
 Contractr/Rig: Tonto/U-5000
 Day Shift
 Driller: Fierback
 Helper: J.K.
 Helper: K.L.
 Night Shift
 Driller: Cunningham
 Helper: K.M.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits:

Additional Information: Drilling ahead with HQ from 3,934 - 3,976 feet. Drilling in dikes and minor submarine flows, fracturing decreasing and core runs increasing to 5 - 10 feet. Total loss of circulation at 3,970 and 3,975 feet but regained full returns after a few minutes.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 3,976	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 10/20/90
Period End: 0700 10/21/90
Depth Start: 3,976 ft.
Depth End: 3,992 ft.
Footage: 16 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 82
LC @

Date: 10-21-90
Spud Date: 06-01-90
Day #: 143
Contractor/Rig: Tonto/U-3000
Day Shift
Driller: Fierback
Helper: J.K.
Helper: K.L.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ #M6-0309-3 @ 3,980 ft.

Additional Information: Drilling ahead with HQ from 3,976--3,992 feet. Formation continues to be extremely fractured causing short runs (1 - 3 feet). Torque increasing, pull back 140 feet, ream and condition hole back to bottom, torque dropped to normal, trip out of hole for bit change.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 3,992	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 10/21/90
 Period End: 0700 10/22/90
 Depth Start: 3,992 ft.
 Depth End: 4,025 ft.
 Footage: 33 ft.
 Mud Wt: 8.4 #/gal
 Vis: 44 in 38 out
 Mud pH: 9.0
 Mud Temp (F): IN 75 OUT 82
 LC @ 3,994 ft.

Date: 10-22-90
 Spud Date: 06-01-90
 Day #: 144
 Contractor/Rig: Tonto/U-5000
 Day Shift
 Driller: Fierback
 Helper: J.K.
 Helper:
 Night Shift
 Driller: Cunningham
 Helper: K.M.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits:

Additional Information: Drilling ahead with HQ from 3,992 - 4,025 feet. Extremely fractured dike rock and sand forcing short runs and some caving. Night shift had to ream out of bottom 50 ft. and condition hole prior to tripping out of hole. Total loss of returns at 3,994 ft. and continued for 2 hours. Regained partial returns after spotting LC pill of cotton seed hulls, and full returns during next two hours of drilling. Total loss approx. 50 bbls.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,025	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SDH-1
Period Start: 0700 10/22/90
Period End: 0700 10/23/90
Depth Start: 4,025 ft.
Depth End: 4,037 ft.
Footage: 12 ft.
Mud Wt: 8.4 #/gal
Vis: 43 in 37 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 81
LC @

Date: 10-23-90
Spud Date: 06-01-90
Day #: 145
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: J.K.
Helper: K.K.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Drilling ahead with HQ from 4,025 - 4,037 feet. Extremely fractured dike rock and sand forcing short runs and some caving requiring several redrills. Circulation intermittent.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,037	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SQH-1
Period Start: 0700 10/18/90
Period End: 0700 10/19/90
Depth Start: 4,037 ft.
Depth End: 4,064 ft.
Footage: 27 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 81
LC @

Date: 10-24-90
Spud Date: 06-01-90
Day #: 146
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: J.K.
Helper: K.K.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core HQ from 4,037 - 4,064 feet, badly broken dike rock, intermittent loss of circulation. Broken rock causing short runs and caving required several redrills. Begin tripping for bit change. Temp. survey at 4,046 feet recorded temperature below 100 F minimum on thermometer. Low temperature probably due to loss of drilling fluids in this interval of hole.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,056	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 10/24/90
Period End: 0700 10/25/90
Depth Start: 4,064 ft.
Depth End: 4,081 ft.
Footage: 17 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 81
LC @

Date: 10-25-90
Spud Date: 06-01-90
Day #: 147
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: J.K.
Helper: K.K.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Flarback
Drill Mgr: Deymonaz

Bits: HQ #M4-0308-3 @ 4,064 ft.

Additional Information: Finish tripping out of hole, change bit, landing ring and core barrel, trip in hole. Drill ahead with HQ from 4,064 - 4,081 feet. Formation continues to consist of extremely fractured dike rock forcing short runs and some caving. Circulation intermittent with maximum returns of 50%.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,081	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 10/25/90
Period End: 0700 10/26/90
Depth Start: 4,081 ft.
Depth End: 4,098 ft.
Footage: 17 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 82
LC @

Date: 10-26-90
Spud Date: 06-01-90
Day #: 148
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LeOrange
Helper: J.K.
Helper: K.K.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core HQ from 4,081 - 4,098 feet, badly broken dike rock, intermittent loss of circulation with maximum of 50% returns. Broken rock causing short runs. Condition hole at 4,098 feet, trip out of hole for bit change and begin tripping back in.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/33#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,098	N/A	N/A

DAILY DRILLING REPORT

Hole # 90H-1
 Period Start: 0700 10/26/90
 Period End: 0700 10/27/90
 Depth Start: 4,098 ft.
 Depth End: 4,113 ft.
 Footage: 15 ft.
 Mud Wt: 8.4 #/gal
 Vis: 44 in 38 out
 Mud pH: 9.0
 Mud Temp (F): IN 76 OUT 81
 LC @

Date: 10-27-90
 Spud Date: 06-01-90
 Day #: 149
 Contractor/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: J.K.
 Helper: K.K.
 Night Shift
 Driller: Cunningham
 Helper: K.M.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits:

Additional Information: Finish tripping drill rods back in hole, hit cave 23 feet off bottom, drill cave and condition hole for 3 1/2 hours. Formation continues to be entirely dense, hard fractured basalt dike. Core barrel blocking after 1 - 3 feet, forcing crew to retrieve inner tube 8 times during 15 feet of drilling.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,113	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 10/27/90
Period End: 0700 10/28/90
Depth Start: 4,113 ft.
Depth End: 4,120 ft.
Footage: 7 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 3B out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 82
LC @

Date: 10-28-90
Spud Date: 06-01-90
Day #: 150
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: J.K.
Helper: K.K.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ #20180-2 @ 4,120 ft.

Additional Information: Core HQ from 4,113 - 4,120 feet, badly broken dike rock, loss of circulation with intermittent 10 - 40% returns. Had to retrieve inner tube 5 times in 7 feet of drilling. Stuck rods at 4,120 feet, pulled back 15 feet and spend next 5 hours conditioning hole and drilling cave. Trip rods out of hole for new bit. Install new "ratcheting" core barrel designed to shake barrel to free blocked core. Run in hole, ream and drill back to bottom. Back on bottom at end of shift.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,120	N/A	N/A

GROWING NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #: SOH-1
Period Start: 0700 10/28/90
Period End: 0700 10/29/90
Depth Start: 4,120 ft.
Depth End: 4,135 ft.
Footage: 15 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 39 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 82
LC @

Date: 10-29-90
Spud Date: 06-01-90
Day #: 151
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: J.K.
Helper: K.K.
Night Shift
Driller: Cunningham
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ #M40308-4 @ 4,134 ft.

Additional Information: Drilling ahead with HQ from 4,120 - 4,135 feet, drill 4 feet of cave on reentering hole. First run with new core barrel took 4 feet of cave and 5.5 feet of new core for 9.5 foot run. Following runs were 2 - 3 feet and some cave had to be drilled out each time. Trip for bit change at 4,135 feet. Drilling cave and rubble had ruined inner gauge of bit, forcing oversized material to block barrel. Trip back in hole, drill cave and condition hole for 4 hours, back on bottom at end of shift.

Intermittent fluid returns, with maximum returns approximately 50 %.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,135	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 10/29/90
 Period End: 0700 10/30/90
 Depth Start: 4,135 ft.
 Depth End: 4,167 ft.
 Footage: 32 ft.
 Mud Wt: 8.4 #/gal
 Vis: 44 in 38 out
 Mud pH: 9.0
 Mud Temp (F): IN 76 OUT 81
 LC @

Date: 10-30-90
 Spud Date: 06-01-90
 Day #: 152
 Contractor/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: J.K.
 Helper: K.K.
 Night Shift
 Driller: Cunningham
 Helper: K.M.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits:

Additional Information: Finish tripping drill rods back in hole, drill cave, core HQ 4,135 - 4,167 feet, fractured, short runs. Intermittent loss of circulation. Maximum returns approximately 50%. Trip out of hole for bit change.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,167	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 10/30/90
 Period End: 0700 10/31/90
 Depth Start: 4,167 ft.
 Depth End: 4,181 ft.
 Footage: 14 ft.
 Mud Wt: 8.4 #/gal
 Vis (sec): 44 in 38 out
 Mud pH: 9.0
 Mud Temp (F): IN 75 OUT 80
 LC @

Date: 10-31-90
 Spud Date: 06-01-90
 Day #: 153
 Contract/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: J.K.
 Helper: K.K.
 Night Shift
 Driller: Cunningham
 Helper: K.M.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits: HQ #BL20180-1 @ 4,167 ft.

Additional Information: Trip rods in hole, drill out cave, core HQ from 4,167 - 4,181 feet, badly broken dike rock, loss of circulation with intermittent 10 - 40% returns.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,181	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 10/31/90
Period End: 0700 11/1/90
Depth Start: 4,181 ft.
Depth End: 4,188 ft.
Footage: 7 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 39 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 81
LC @

Date: 11-1-90
Spud Date: 06-01-90
Day #: 154
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: K.L.
Night Shift
Driller: Cunningham
Helper: M.L.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ bit #08-8387 @ 4,182 ft.

Additional Information: Core HQ 4,181 - 4,182 ft., trip for bit change, 4.5 hours drilling cave and conditioning hole. Core 4,182 - 4,188 ft. intermittent fluid returns, generally 20 - 40%. Formation continues to be extremely broken with fragments ranging in size from 1/4 to 2 inches resulting in short runs.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,188	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # 80H-1
Period Start: 0700 11/1/90
Period End: 0700 11/2/90
Depth Start: 4,188 ft.
Depth End: 4,214 ft.
Footage: 26 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 80
LC @

Date: 11-2-90
Spud Date: 06-01-90
Day #: 155
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: Cunningham
Helper: M.L.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core HQ 4,188 - 4,214 feet, in fractured, rubblized dike rock. Circulation varies from 10 - 50 %. Condition hole for 1 hour and trip out of hole for bit changes. Bottom hole temperature measurement of 108 F at 4,202 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,214	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/2/90
Period End: 0700 11/3/90
Depth Start: 4,214 ft.
Depth End: 4,226 ft.
Footage: 12 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 39 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 81
LC @

Date: 11-3-90
Spud Date: 06-01-90
Day #: 156
Contractor/Rig: Tonto/U-3000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: Cunningham
Helper: McLeod
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ bit #08-8396 @ 4,214 ft.

Additional Information: Finish tripping out of hole, change bit, trip in hole. Ream & wash from 4,090 - 4,214 feet, core HQ 4,214 - 4,226 ft. Core 4,214 - 4,226 ft. with partial drilling fluid returns. Formation continues to be extremely broken with fragments ranging in size from 1/4 to 2 inches resulting in short runs.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,226	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/3/90
Period End: 0700 11/4/90
Depth Start: 4,226 ft.
Depth End: 4,236 ft.
Footage: 10 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 80
LC @

Date: 11-4-90
Spud Date: 06-01-90
Day #: 157
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: Cunningham
Helper: McLeod
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ bit #L-77530 @ 4,236 ft.

Additional Information: Core HQ 4,226 - 4,236 feet, in fractured, rubblized dike rock. Circulation varies from 20 - 50 %. Condition hole for 1.5 hours and trip out of hole for bit change. Ream and wash hole from 4,080 feet to TD for 4 hours.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,236	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/4/90
Period End: 0700 11/5/90
Depth Start: 4,236 ft.
Depth End: 4,248 ft.
Footage: 12 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 48 in 41 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 83
LC @

Date: 11-5-90
Spud Date: 06-01-90
Day #: 158
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: Cunningham
Helper: McLeod
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Spend 4 hours drilling out sandy cave. Drill ahead with HQ from 4,236 - 4,248 feet. Formation remaining broken forcing short core runs. First use of new bit design sent by Longyear Co., penetration rate only about 1 ft/hour, less than half of previous bits. Will discuss with bit engineer and modified design should arrive on Wednesday.

Drilling fluid returns remaining fairly constant at 50 - 60 %. with occasional temporary total losses.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,248	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 11/5/90
 Period End: 0700 11/6/90
 Depth Start: 4,248 ft.
 Depth End: 4,260 ft.
 Footage: 12 ft.
 Mud Wt: 8.4 #/gal
 Vis: 45 in 40 out
 Mud pH: 9.0
 Mud Temp (F): IN 75 OUT 80
 LC @

Date: 11-6-90
 Spud Date: 06-01-90
 Day #: 159
 Contractr/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: K.K.
 Helper:
 Night Shift
 Driller: Cunningham
 Helper: J.K.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits: HQ bit #OS-8399 @ 4,260 ft.

Additional Information: Core HQ from 4,248 - 4,260 feet.
 Condition hole for 1 hour, trip out of hole for bit change, wash
 & ream back into hole from 4,120 feet to TD. On bottom at end
 of shift. Formation continues to be extremely broken.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,260	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/6/90
Period End: 0700 11/7/90
Depth Start: 4,260 ft.
Depth End: 4,287 ft.
Footage: 27 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 80
LC @

Date: 11-7-90
Spud Date: 06-01-90
Day #: 160
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: Cunningham
Helper: J.K.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core HQ 4,260 - 4,287 feet, in fractured rock. Circulation varies from 40 - 50 %.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,287	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/7/90
Period End: 0700 11/8/90
Depth Start: 4,287 ft.
Depth End: 4,302 ft.
Footage: 15 ft.
Mud Wt: 8.4 #/gal
Vis: 45 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 81
LC @

Date: 11-8-90
Spud Date: 06-01-90
Day #: 161
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: J.K.
Helper: R.O.
Helper:
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ bit #06-8397 @ 4,302 ft.

Additional Information: Core HQ from 4,287 - 4,302 feet. Pull back 130 feet and ream and condition hole, trip out for bit change, begin tripping back in hole. Circulation at 50 - 80%, although formation continues to be extremely fractured. Bottom hole temperature at 4,302 feet: 124 F. Trace of sulfides and anhydrite mineralization along some tight fractures.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,302	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 11/8/90
 Period End: 0700 11/9/90
 Depth Start: 4,302 ft.
 Depth End: 4,307 ft.
 Footage: 5 ft.
 Mud Wt: 8.4 #/gal
 Vis (sec): 45 in 38 out
 Mud pH: 9.0
 Mud Temp (F): IN 75 OUT 82
 LC @

Date: 11-9-90
 Spud Date: 06-01-90
 Day #: 162
 Contract/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: K.K.
 Helper:
 Night Shift
 Driller: McLeod
 Helper: J.K.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits:

Additional Information: Ream and wash back to bottom, 15 hours. Core HQ 4,302 - 4,307 feet, hole caving, requiring reaming back to bottom each time tube is pulled to retrieve core. Hole will probably need to be reduced to NQ on next bit change which will eliminate caving problems to that point. Prior to reducing the hole, HQ rods with a casing shoe (narrow faced bit) will be placed to TD and NQ sized hole (3 inch) drilled below that point.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,307	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # 50H-1
Period Start: 0700 11/9/90
Period End: 0700 11/10/90
Depth Start: 4,307 ft.
Depth End: 4,325 ft.
Footage: 18 ft.
Mud Wt: 8.4 #/gal
Vis: 45 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 81
LC @

Date: 11-10-90
Spud Date: 06-01-90
Day #: 163
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: McCleod
Helper: J.K.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: HQ bit #L-77689 @ 4,325 ft.

Additional Information: Core HQ from 4,307 - 4,325 feet.
Return of drilling fluids at 50 - 75% and formation continues to be pervasively fractured. Pull back 120 feet and ream and condition hole back to 4,314 feet where bit could no longer drill, trip out for bit change.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,325	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SDH-1
Period Start: 0700 11/10/90
Period End: 0700 11/11/90
Depth Start: 4,325 ft.
Depth End: 4,325 ft.
Footage: 0 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 38 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 80
LC @

Date: 11-11-90
Spud Date: 06-01-90
Day #: 164
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: McLeod
Helper: J.K.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: NQ Bit #L33201 @ 4,325 ft.

Additional Information: Run in hole with new HQ bit, hit cave at 4,150 feet. Wash and ream back to TD at 4,325 feet, bit gone, unable to maintain hole stability. Set HQ rods with donut below wellhead and back off. Pick up NQ rods and trip in hole.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,325	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # 80H-1
Period Start: 0700 11/11/90
Period End: 0700 11/12/90
Depth Start: 4,325 ft.
Depth End: 4,334 ft.
Footage: 9 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 39 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 80
LC @

Date: 11-12-90
Spud Date: 06-01-90
Day #: 165
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: McLeod
Helper: J.K.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Finish tripping rods back in hole, drill thru landing ring and bit. Core ahead with NQ from 4,325 - 4,334 feet when bit failed. Trip out of hole for bit change, drilling out steel landing ring had broken off section of bit face. Drilling fluid returns intermittent.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,334	HQ (0-4,325 temp)	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # 60H-1
Period Start: 0700 11/12/90
Period End: 0700 11/13/90
Depth Start: 4,334 ft.
Depth End: 4,360 ft.
Footage: 26 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 39 out
Mud pH: 9.0
Mud Temp. (F): IN 75 OUT 80
LC @ 4,335 ft.

Date: 11-13-90
Spud Date: 06-01-90
Day #: 166
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper:
Night Shift
Driller: McLeod
Helper: J.K.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits: NQ bit #9809-5 @ 4,334 ft.

Additional Information: Change out bit, trip rods back in hole, drill NQ from 4,334 - 4,360 feet. Encountered total loss of return fluids in open fracture from 4,335 - 4,338 ft. Rock continues to be pervasively fractured causing short core runs.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,360	HQ (0-4,325 temp)	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # 80H-1
Period Start: 0700 11/13/90
Period End: 0700 11/14/90
Depth Start: 4,360 ft.
Depth End: 4,364 ft.
Footage: 4 ft.
Mud Wt: 8.4 #/gal
Vis: 45 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 81
LC @

Date: 11-14-90
Spud Date: 06-01-90
Day #: 167
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: NQ bit #MX5-6383-4 @ 4,364 ft.

Additional Information: Core NQ from 4,360 - 4,364 feet, in poorly consolidated brecciated rock and sand. Core runs of 0.5 - 1.5 feet each with caving between runs. Trip out of hole for bit change. Wash and ream back into hole from 4,342 feet, unable to keep hole open, begin tripping out of hole for bit change.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,364	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/14/90
Period End: 0700 11/15/90
Depth Start: 4,364 ft.
Depth End: 4,364 ft.
Footage: 0 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 49 in 43 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 80
LC @

Date: 11-15-90
Spud Date: 06-01-90
Day #: 168
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: 2-15/16" tricone #128269

Additional Information: Run in hole with 2-15/16" tricone, clean and condition hole from 4,338 to 4,362 feet. Each section requiring numerous passes to clean and stabilize. Fluid returns remaining at 70 - 80%.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,364	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # BOH-1
 Period Start: 0700 11/15/90
 Period End: 0700 11/16/90
 Depth Start: 4,364 ft.
 Depth End: 4,387 ft.
 Footage: 23 ft.
 Mud Wt: 8.4 #/gal
 Vis: 43 in 40 out
 Mud pH: 9.0
 Mud Temp (F): IN 75 OUT 79
 LC @

Date: 11-16-90
 Spud Date: 06-01-90
 Day #: 169
 Contractor/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: K.K.
 Helper: J.K.
 Night Shift
 Driller: McCleod
 Helper: K.M.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits: NQ bit #L-74607 @ 4,364 ft.

Additional Information: Finish reaming and conditioning hole with 2-15/16" tricone bit to 4,364 feet. Trip out of hole, change to NQ core drilling assembly and trip in hole. Hit minor cave at 4,362 feet and ream final 2 feet to bottom. Hole now staying clean and torque has reduced to normal levels. Core NQ from 4,364 - 4,387 feet in 13 hours. Formation more competent permitting longer core runs (8 & 10 feet). Rock type primarily submarine volcanics and angular reworked volcanics.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,387	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/16/90
Period End: 0700 11/17/90
Depth Start: 4,387 ft.
Depth End: 4,429 ft.
Footage: 42 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 43 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 80
LC @

Date: 11-17-90
Spud Date: 06-01-90
Day #: 170
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 4,387 - 4,429 ft. with fluid returns at 90 - 100%. Formation alternates between being solid and competent and broken rubble. Rock composed of submarine volcanics and sediments with angular basaltic fragments. Bottom hole temperature of 120 F recorded at 4,410 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,429	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 11/17/90
 Period End: 0700 11/18/90
 Depth Start: 4,429 ft.
 Depth End: 4,460 ft.
 Footage: 31 ft.
 Mud Wt: 8.4 #/gal
 Vis (sec): 43 in 39 out
 Mud pH: 9.0
 Mud Temp (F): IN 75 OUT 79
 LC @

Date: 11-18-90
 Spud Date: 06-01-90
 Day #: 171
 Contractor/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: K.K.
 Helper: J.K.
 Night Shift
 Driller: McLeod
 Helper: K.M.
 Helper: R.O.
 Foreman: Fierback
 Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 4,429 - 4,460 feet in relatively soft but pervasively broken submarine volcanics and sedimentary rock composed of angular basalt fragments in sandy clay matrix. Broken nature of rock forcing short core runs. Fluid returns remaining at 90 - 100% and hole remaining open with no cave.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,460	HQ (0-4,325 temp)	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/18/90
Period End: 0700 11/19/90
Depth Start: 4,460 ft.
Depth End: 4,490 ft.
Footage: 30 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 43 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 76 OUT 80
LC G

Date: 11-19-90
Spud Date: 06-01-90
Day #: 172
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 4,460 - 4,490 feet in relatively soft but pervasively broken submarine volcanics and sedimentary rock. Broken nature of rock forcing short core runs. Fluid returns remaining at 90 - 100% and hole remaining open with no cave.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,490	HQ (0-4,325 temp)	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 11/19/90
 Period End: 0700 11/20/90
 Depth Start: 4,490 ft.
 Depth End: 4,530 ft.
 Footage: 40 ft.
 Mud Wt: 8.4 #/gal
 Vis: 43 in 40 out
 Mud pH: 9.0
 Mud Temp (F): IN 73 OUT 78
 LC @

Date: 11-20-90
 Spud Date: 06-01-90
 Day #: 173
 Contractor/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: K.K.
 Helper: J.K.
 Night Shift
 Driller: McCleod
 Helper: K.M.
 Helper: R.O.
 Foreman: Cunningham
 Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ 4,490 - 4,530 feet. Drilling ahead with 90 - 100% returns. Last two bottom hole temperature measurements: 122 F @ 4,437 feet and 130 F @ 4,500 feet. Rock type continues to be primarily angular clastic material with interbedded fine grained sediments.

History

Hole Size	Interval (ft)	Casing Size (Interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,530	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/20/90
Period End: 0700 11/21/90
Depth Start: 4,530 ft.
Depth End: 4,565 ft.
Footage: 35 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 43 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 11-21-90
Spud Date: 06-01-90
Day #: 174
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 4,530 - 4,565 ft. with fluid returns at 90 - 100%. Formation consists of angular clastic material with interbedded fine (silt sized) sediments.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/33#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4"	3,022 to 4,565	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/21/90
Period End: 0700 11/22/90
Depth Start: 4,565 ft.
Depth End: 4,595 ft.
Footage: 30 ft.
Mud Wt: 8.4 #/gal
Vis: 43 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 11-22-90
Spud Date: 06-01-90
Day #: 175
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ 4,565 - 4,595 feet. Drilling ahead with 90 - 100% returns. Bottom hole temperature of 134 F measured at 4,576 ft. Rock becoming more fractured forcing short core runs. Minor caving causing some sticking and increased torque.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HG)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 4,595	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
 Period Start: 0700 11/22/90
 Period End: 0700 11/23/90
 Depth Start: 4,595 ft.
 Depth End: 4,597 ft.
 Footage: 2 ft.
 Mud Wt: 8.4 #/gal
 Vis (sec): 50 in 46 out
 Mud pH: 9.0
 Mud Temp (F): IN 73 OUT 78
 LC 8

Date: 11-23-90
 Spud Date: 06-01-90
 Day #: 176
 Contractor/Rig: Tonto/U-5000
 Day Shift
 Driller: LaOrange
 Helper: K.K.
 Helper: J.K.
 Night Shift
 Driller: McLeod
 Helper: K.M.
 Helper: R.O.
 Foreman: Cunningham
 Drill Mgr: Daymonaz

Bits: 2-15/16" tricone #A1023

Additional Information: Core NQ from 4,595 - 4,597 ft. with fluid returns at 90 - 100%. Formation very broken, with only 6 inches recovered on 2 ft. core run. Hole caving, rods becoming very tight. Pull out of hole, change drilling assembly and trip in hole with 2-15/16" tricone. Ream hole from 4,231 - 4,593 ft, encountering scattered bridges in hole and fill below 4,590 ft which required several passes to clean and stabilize.

History

Hole Size	Interval (ft)	Casing Size (Interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,597	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # 80H-1
Period Start: 0700 11/23/90
Period End: 0700 11/24/90
Depth Start: 4,597 ft.
Depth End: 4,602 ft.
Footage: 5 ft.
Mud Wt: 8.4 #/gal
Vis: 43 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 11-24-90
Spud Date: 06-01-90
Day #: 177
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Daymonaz

Bits: NQ bit #09-10589 @ 4,597 ft.

Additional Information: Finish reaming and conditioning hole to 4,597 feet. Trip out, change to NQ drilling assembly, trip in, encounter minor bridging below 4,352 feet which required reaming to bottom. Formation predominantly fine grained submarine basalt flows, pervasively fractured. Core runs 0.5 - 1.5 feet each and cave continues to be a problem on each retrieval. Full fluid returns. Bottom hole temperature of 138 F measured at 4,597 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,602	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/24/90
Period End: 0700 11/25/90
Depth Start: 4,602 ft.
Depth End: 4,621 ft.
Footage: 19 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 45 in 41 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 11-25-90
Spud Date: 06-01-90
Day #: 178
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 4,602 - 4,614 feet, short runs (0.5 - 2 feet), with cave requiring redrilling to bottom each time. Sweep hole with several high viscosity pills which reduced torque. Final run from 4,614 to 4,621 feet remains in same rock type (fine grained submarine volcanics) but solid core rather than rubble.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,621	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/25/90
Period End: 0700 11/26/90
Depth Start: 4,621 ft.
Depth End: 4,650 ft.
Footage: 29 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 79
LC @

Date: 11-26-90
Spud Date: 06-01-90
Day #: 179
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 4,621 - 4,650 feet in fine grained and pervasively broken submarine volcanics. Drilling fluid returns at 90 - 100 %, minor caving and sticking together with short core runs continue to slow progress.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.3#
4" (HQs)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,650	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/26/90
Period End: 0700 11/27/90
Depth Start: 4,650 ft.
Depth End: 4,684 ft.
Footage: 34 ft.
Mud Wt: 8.4 #/gal
Vis: 43 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 11-27-90
Spud Date: 06-01-90
Day #: 180
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ 4,650 - 4,684 feet. Core runs range from 0.5 feet to 9 feet in fine grained submarine volcanics. Drilling fluid returns remain at 90 - 100%. Sudden increase in anhydrite mineralization at 4,651 feet coincided with a definite increase in bottom hole temperature. A temperature measurement of 154 F was recorded at 4,667 feet, an increase of 16 F from the 138 F temperature recorded at 4,597 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,684	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/27/90
Period End: 0700 11/28/90
Depth Start: 4,684 ft.
Depth End: 4,699 ft.
Footage: 15 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 11-28-90
Spud Date: 06-01-90
Day #: 181
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 4,684 - 4,699 feet, rock becoming more competent due to anhydrite mineralization cementing fractured submarine volcanics. At 4:30 PM drill rods torked up suddenly and pulled apart at tool joint at 1,900 feet. Trip out of hole, pick up Bowlen spear and trip in hole. Stab into NQ rods and pull free. Trip out of hole, pick up 2-15/16" tricone and trip in to ream and condition hole. Encounter first bridge at 4,360 feet and begin reaming to bottom.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,699	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # BOH-1
Period Start: 0700 11/28/90
Period End: 0700 11/29/90
Depth Start: 4,699 ft.
Depth End: 4,699 ft.
Footage: 0 ft.
Mud Wt: 8.4 #/gal
Vis: 43 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 11-29-90
Spud Date: 06-01-90
Day #: 182
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Daymonaz

Bits: NQ bit #L-74606 @ 4,699 ft.

Additional Information: Complete reaming hole to bottom, trip out of hole and lay down rotary tools, pick up NQ coring assembly and run in hole. Encounter minor obstructions below 4,370 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 4,699	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/29/90
Period End: 0700 11/30/90
Depth Start: 4,699 ft.
Depth End: 4,723 ft.
Footage: 24 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 80
LC @

Date: 11-30-90
Spud Date: 06-01-90
Day #: 183
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Deymonaz

Bits:

Additional Information: Finish reaming to bottom. Core NQ 4,699 - 4,723 feet with nearly full fluid returns. Rock continues to be very broken with considerable anhydrite mineralization cementing some brecciated material together but majority of interval broken and loose, resulting in 1 - 3 foot core runs. Bottom hole temperature of 168 F measured at 4,701 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HG)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 4,723	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 11/30/90
Period End: 0700 12/1/90
Depth Start: 4,723 ft.
Depth End: 4,753 ft.
Footage: 30 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 82
LC @

Date: 12-1-90
Spud Date: 06-01-90
Day #: 184
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 4,723 - 4,753 feet in fine grained and pervasively broken submarine volcanics with intervals of abundant anhydrite mineralization cementing brecciated material together. Core runs of 0.5 - 2.5 feet in loose brecciated intervals while more competent intervals yield 4 - 5 foot runs. Drilling fluid returns at 90 - 100 %.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQs)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,753	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # 90H-1
Period Start: 0700 12/1/90
Period End: 0700 12/2/90
Depth Start: 4,753 ft.
Depth End: 4,777 ft.
Footage: 24 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 82
LC @

Date: 12-2-90
Spud Date: 06-01-90
Day #: 185
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: LaOrange
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Cunningham
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 4,753 - 4,777 feet in same rock as previous day with short core runs. Bottom hole temperature measurement of 152 F at 4,753 feet. Drilling fluid returns at 90 - 100 %.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQs)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 4,777	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # 8QH-1
Period Start: 0700 12/2/90
Period End: 0700 12/3/90
Depth Start: 4,777 ft.
Depth End: 4,812 ft.
Footage: 35 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 82
LC @

Date: 12-3-90
Spud Date: 06-01-90
Day #: 186
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ 4,777 - 4,812 feet with 90 - 100% drilling fluid returns. Bottom hole temperature of 156 F was measured at 4,790 feet. Rock continues to be broken, but secondary mineralization cements some intervals to increase competency.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,812	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/3/90
Period End: 0700 12/4/90
Depth Start: 4,812 ft.
Depth End: 4,812 ft.
Footage: 0 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 81
LC @

Date: 12-4-90
Spud Date: 06-01-90
Day #: 187
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits: 2-15/16" tricone #L83994

Additional Information: Driller was unable to pump inner tube down rods after recovering core. Blockage was caused by a tool joint which had partially failed at 1,200 feet. Considerable drag on rods while tripping out. Tripped all drill rods out of hole to visually inspect each tool joint. Pick up 2/15/16" tricone and ream & wash to bottom of hole. Cave and sand encountered at 4,410-4,418 ft., 4,550-4,556 ft., and 4,575-4,580 ft. Begin tripping out of hole.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/33#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,812	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/4/90
Period End: 0700 12/5/90
Depth Start: 4,812 ft.
Depth End: 4,855 ft.
Footage: 43 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 82
LC @

Date: 12-5-90
Spud Date: 06-01-90
Day #: 188
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits: NQ bit #L67694 @ 4,812 ft.

Additional Information: Finish tripping out, lay down rotary tools, pick up NQ coring assembly and trip in hole. Only minor obstructions encountered below 4,350 feet and 1.5 feet of cave in bottom of hole. Core NQ 4,812 - 4,855 feet in 16 hours. Core runs of 7 - 10 feet in dense submarine volcanics. Nearly full returns of drilling fluids.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQs)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,855	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SDH-1
Period Start: 0700 12/5/90
Period End: 0700 12/6/90
Depth Start: 4,855 ft.
Depth End: 4,880 ft.
Footage: 25 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 82
LC @

Date: 12-6-90
Spud Date: 06-01-90
Day #: 189
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits: 2-15/16" tricone #44613

Additional Information: Core NQ from 4,855 - 4,880 feet in dense, competent submarine volcanics. Bottom hole temperature of 180 F recorded at 4,865 feet. Rubble zones at 4,871-4,872 feet and 4,879-4,880 feet. Dropped core on run at 4,880 feet which wedged in rods just above bit, trip out of hole after several unsuccessful attempts to clear obstruction. Trip in hole with 2-15/16" tricone.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQs)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 4,880	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # : 30H-1	Date: 12-7-90
Period Start: 0700 12/6/90	Spud Date: 06-01-90
Period End: 0700 12/7/90	Day #: 190
Depth Start: 4,880 ft.	Contractr/Rig: Tonto/U-5000
Depth End: 4,888 ft.	Day Shift
Footage: 8 ft.	Driller: Cunningham
Mud Wt: 8.4 #/gal	Helper: K.K.
Vis: 44 in 40 out	Helper: J.K.
Mud pH: 9.0	Night Shift
Mud Temp (F): IN 74 OUT 81	Driller: McCleod
LC @	Helper: K.M.
	Helper: R.O.
	Foreman: Fierback
	Drill Mgr: Daymonaz

Bits: NQ bit #L-67701 @ 4,880 ft.

Additional Information: Ream and wash hole to TD with 2 1/16" bit. Encounter first bridge at 4,490 feet, trip out, lay down rotary tools, pick up core drilling assembly and trip in hole. Hole in good condition, only minor obstructions encountered.

Core N

Q from 4,880 - 4,880 in competent submarine volcanics. Nearly full drilling fluid returns.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/33#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,888	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SDH-1
Period Start: 0700 12/7/90
Period End: 0700 12/8/90
Depth Start: 4,888 ft.
Depth End: 4,941 ft.
Footage: 53 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 81
LC @

Date: 12-8-90
Spud Date: 06-01-90
Day #: 191
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 4,888 - 4,941 feet in predominantly solid submarine volcanics and coarse grained sediments. Nearly full return of drilling fluids. Bottom hole temperature measurement of 214 F recorded at 4,904 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 4,941	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/8/90
Period End: 0700 12/9/90
Depth Start: 4,941 ft.
Depth End: 4,991 ft.
Footage: 50 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 80
LC @

Date: 12-9-90
Spud Date: 06-01-90
Day #: 192
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NG 4,941 - 4,991 feet in competent submarine basalt flows and coarse grained sedimentary rock. Nearly full returns of drilling fluids. Bottom hole temperature of 216 F recorded at 4,961 feet.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 4,991	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/9/90
Period End: 0700 12/10/90
Depth Start: 4,991 ft.
Depth End: 5,043 ft.
Footage: 52 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 82
LC @

Date: 12-10-90
Spud Date: 06-01-90
Day #: 193
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NO 4,991 - 5,043 feet in fairly competent submarine volcanics and clastic sediments. Core runs of 10 feet common, with some broken material and shorter runs (4.5 - 6 feet) from 5,020 - 5,043 feet. Nearly full returns of drilling fluids. Bottom hole temperature of 230 F recorded at 5,011 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQs)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,043	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/10/90
Period End: 0700 12/11/90
Depth Start: 5,043 ft.
Depth End: 5,078 ft.
Footage: 35 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 81
LC @

Date: 12-11-90
Spud Date: 06-01-90
Day #: 194
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 5,043 - 5,078 feet in submarine volcanics and coarse grained sediments with nearly full return of drilling fluids. Formation moderately fractured below 5,021 feet resulting in shorter core runs (4 - 7 feet). Bottom hole temperature measurement of 240 F recorded at 5,061 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 5,078	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # 50H-1
Period Start: 0700 12/11/90
Period End: 0700 12/12/90
Depth Start: 5,078 ft.
Depth End: 5,116 ft.
Footage: 38 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 80
LC @

Date: 12-12-90
Spud Date: 06-01-90
Day #: 195
Contractor/Rig: Tonto/U-3000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper: J.K.
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ 5,078 - 5,116 feet in submarine basalt flows and coarse grained sedimentary rock (reworked volcanics) with nearly full return of drilling fluids. Rock continues to be broken with core runs of 4 - 7 feet. Bottom hole temperature of 220 F recorded at 5,078 feet. Decrease in BHT probably resulting from fractured nature of formation which allows drilling fluids to circulate some distance from bore hole.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,116	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/12/90
Period End: 0700 12/13/90
Depth Start: 5,116 ft.
Depth End: 5,159 ft.
Footage: 43 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 80
LC @

Date: 12-13-90
Spud Date: 06-01-90
Day #: 196
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: J.K.
Helper:
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 5,116 - 5,159 feet in submarine volcanics and coarse grained sediments with nearly full return of drilling fluids. Formation moderately fractured resulting in shorter core runs (3 - 6 feet). Bottom hole temperature measurement of 190 F recorded at 5,155 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 5,159	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SDH-1
Period Start: 0700 12/13/90
Period End: 0700 12/14/90
Depth Start: 5,159 ft.
Depth End: 5,198 ft.
Footage: 39 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 80
LC @

Date: 12-14-90
Spud Date: 06-01-90
Day #: 197
Contractor/Rig: Tonto/U-3000
Day Shift
Driller: Cunningham
Helper: J.K.
Helper:
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ 5,159 - 5,198 feet in submarine basalt flows with nearly full return of drilling fluids. Rock continues to be broken with core runs of 3 - 6 feet. Bottom hole temperature of 200 F recorded at 5,198 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HG)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NG)	4,325 to 5,198	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/14/90
Period End: 0700 12/15/90
Depth Start: 5,198 ft.
Depth End: 5,247 ft.
Footage: 49 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 78
LC @

Date: 12-15-90
Spud Date: 06-01-90
Day #: 198
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: J.K.
Helper:
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 5,198 - 5,247 feet in submarine volcanics and coarse grained clastic material with approximately 80% return of drilling fluids. Formation moderately fractured to 5,210 feet resulting in 5 foot core runs. Below 5,210 feet the rock is fairly competent with abundant recementing of fractures with secondary mineralization permitting 8 - 10 foot core runs.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,247	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # 30H-1
Period Start: 0700 12/15/90
Period End: 0700 12/16/90
Depth Start: 5,247 ft.
Depth End: 5,295 ft.
Footage: 48 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 12-16-90
Spud Date: 06-01-90
Day #: 199
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: J.K.
Helper:
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NO 5,247 - 5,295 feet in submarine basalt flows with approximately 75% return of drilling fluids. Rock continues to be competent with 8 - 10 foot core runs. Bottom hole temperature of 210 F recorded at 5,257 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,295	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SQH-1
Period Start: 0700 12/16/90
Period End: 0700 12/17/90
Depth Start: 5,295 ft.
Depth End: 5,342 ft.
Footage: 47 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 75 OUT 79
LC @

Date: 12-17-90
Spud Date: 06-01-90
Day #: 200
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: J.K.
Helper:
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ 5,295 - 5,342 feet in fairly competent submarine volcanics and clastic sediments. Core runs of 8 - 10 feet. Drilling fluid returns at approximately 80%. Bottom hole temperature of 215 F recorded at 5,305 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQs)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,342	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/17/90
Period End: 0700 12/18/90
Depth Start: 5,342 ft.
Depth End: 5,382 ft.
Footage: 40 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 78
LC @

Date: 12-18-90
Spud Date: 06-01-90
Day #: 201
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper:
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Daymonaz

Bits:

Additional Information: Core NQ from 5,342 - 5,382 feet in submarine volcanics and coarse grained clastic material with approximately 80% return of drilling fluids. Rock fairly competent permitting 10 foot runs. Bottom hole temperature of 242 F recorded at 5,352 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,382	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # 30H-1
Period Start: 0700 12/18/90
Period End: 0700 12/19/90
Depth Start: 5,382 ft.
Depth End: 5,422 ft.
Footage: 48 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 12-19-90
Spud Date: 06-01-90
Day #: 202
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper:
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ 5,382 - 5,422 feet in submarine basalt flows with approximately 85% return of drilling fluids. Rock continues to be competent with 10 foot core runs. Bottom hole temperature of 264 F recorded at 5,402 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,422	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/19/90
Period End: 0700 12/20/90
Depth Start: 5,422 ft.
Depth End: 5,456 ft.
Footage: 34 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 78
LC @

Date: 12-20-90
Spud Date: 06-01-90
Day #: 203
Contractor/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper:
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 5,422 - 5,456 feet in submarine volcanics, dikes and coarse grained clastic material with approximately 85% return of drilling fluids. Rock fairly competent permitting 10 foot runs, one broken interval at 5,440 feet resulted in a 4 foot run. Bottom hole temperature of 294 F recorded at 5,450 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,456	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/20/90
Period End: 0700 12/21/90
Depth Start: 5,456 ft.
Depth End: 5,506 ft.
Footage: 50 ft.
Mud Wt: 8.4 #/gal
Vis: 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 74 OUT 78
LC @

Date: 12-21-90
Spud Date: 06-01-90
Day #: 204
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper:
Night Shift
Driller: McCleod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ from 5,456 - 5,506 feet in submarine volcanics with approximately 85% return of drilling fluids. Rock fairly competent permitting 10 foot runs. Bottom hole temperature of 274 F recorded at 5,496 feet.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3022 temp)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,506	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/21/90
Period End: 0700 12/22/90
Depth Start: 5,506 ft.
Depth End: 5,526 ft.
Footage: 20 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 12-22-90
Spud Date: 06-01-90
Day #: 205
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper:
Night Shift
Driller: McLeod
Helper: K.M.
Helper: R.O.
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Core NQ 5,506 - 5,526 feet in submarine volcanics with approximately 85% return of drilling fluids. Terminate drilling at 11 AM and run temperature survey with Kuster temperature tool. Maximum temperature at 5,526 feet after 1 hour 45 minute survey was 326.8 F and increasing slowly. Pull drill rods back up into HQ casing at 4,325 feet and secure rig for Christmas break at 5 PM.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,526	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start: 0700 12/22/90
Period End: 0700 12/23/90
Depth Start: 5,526 ft.
Depth End: 5,526 ft.
Footage: 0 ft.
Mud Wt: 8.4 #/gal
Vis (sec): 44 in 40 out
Mud pH: 9.0
Mud Temp (F): IN 73 OUT 78
LC @

Date: 12-23-90
Spud Date: 06-01-90
Day #: 206
Contractr/Rig: Tonto/U-5000
Day Shift
Driller: Cunningham
Helper: K.K.
Helper:
Night Shift
Driller:
Helper:
Helper:
Foreman: Fierback
Drill Mgr: Deymonaz

Bits:

Additional Information: Lower drill rods, condition hole, attempt to deviation survey in bottom of hole, temperature too high for film. Pull out of hole and shut down site for Christmas break.

History

Hole Size	Interval (ft)	Casing Size(interval)	Grade/Wt
12 1/4"	0 to 202	9 5/8" (0-202)	K-55/40#
8 1/2"	202 to 1,996	7" (0-1,996)	L-80/35#
5 7/8"	1,996 to 2,671	(See below)	
5 1/4"	2,671 to 3,022	4 1/2" (0-3,022)	J-55/10.5#
4" (HQ)	3,022 to 4,325	HQ (0-4,325 temp)	N/A
3" (NQ)	4,325 to 5,526	N/A	N/A

APPENDIX B

COMPLAINT LOGS AND RESPONSE -- SOH 1

Public Contact Sheet

First Contact: answering service ☐
mobile phone ☒ Called direct
walk-in ☐
other ☐ Specify-

Date 10-9-90 Time 0640

Nature of contact: request for information ☐
complaint call ☒

Residents name: Andrew Sarhanis
address : Box 1729 Pahoia
phone number : 965-7154

Contacted by, R. Kochy Date same time -

Remarks:

Resident claims SOH noise wakes him at night.
TMK: 1-4-017-005 (next to Pommernicks)

Action taken:

I explained SOH hole half way finished and that drilling would not continue "forever". Also nighttime noise level measurements are within allowable limits. Notified J. Deymonaz, A. Seki.

For:

SOH

initiated by R. Kochy
date 10-12-90

Public Contact Sheet

First Contact: answering service
 mobile phone
 walk-in
 other

☒ Connected dir. to mobile
☐
☐
☐ Specify-

Date 10-16-90 Time 1630

Nature of contact: request for information
 complaint call

☒
☒

Residents name: Dona Mulder
 address: Not given
 phone number: No phone

Contacted by: R. Koch Date Same time 11

Remarks:

Ran into Debbie Pommerank in Pahoa - gave her the complaint number. Had to get up at 3 Am. Heard machinery - didn't know where it was coming from. Wanted to know what was going on. Lives next to Pommerank (Ocean side)

Action taken:

I explained they drill 24 hrs. a day. Drilling to continue approx. 6 more wks.

For:

SOH

initiated by R. Koch
 date 10-17-90

Public Contact Sheet

First Contact: answering service ☐
mobile phone ☒ Direct
walk-in ☐
other ☐ Specify-

Date 10-21-90 Time 8:15 pm

Nature of contact: request for information ☐
complaint call ☒

Residents name: Mrs. Pommerehne
address: Kapoho
phone number:

Contacted by, R. Kochy Date 10-22-90 time Same

Remarks:

SOH drill rig lights are shining in her window

Action taken:

checked with Rig operator 0900 10-22, light adjustment unchanged since first light complaint shortly after start up. Operator will check tonight and adjust as necessary.

For:

SOH

initiated by R. Kochy
date 10-22-90

Public Contact Sheet

First Contact: answering service ☐ ☒ direct
 mobile phone ☒
 walk-in ☐
 other ☐ Specify-

Date 10-22-90 Time 0615

Nature of contact: request for information ☐
 complaint call ☒

Residents name: Mrs. Lemmenik
 address : Kapoho
 phone number :

Contacted by: R. Kochy Date Same time Same

Remarks:

SOH drilling operation really loud last night.

Action taken:

Rig check - tripping began about 3AM

For:

SOH

initiated by R. Kochy
 date 10-22-90

Public Contact Sheet

First Contact: answering service ☐
 mobile phone ☒ direct call
 walk-in ☐
 other ☐ Specify-

Date 10-27-90 time 0900

Nature of contact: request for information ☐
 complaint call ☒

Residents name: Mrs. Pommerink
 address :
 phone number :

Contacted by, R. Kocay Date Same time Same

Remarks:

"SOH really noisy last night"

Resident also called Oremat to complain - they said they weren't doing anything.

Action taken:

Checked with rig on Friday night operation - drilling only.

For: SOH

Initiated by R. Kocay
 date 10-29-90

Public Contact Sheet

First Contact: answering service ☐
 mobile phone ☒ Direct call
 walk-in ☐
 other ☐ Specify-

Date 10-28-90 Time 2235

Nature of contact: request for information ☐
 complaint call ☒

Residents name: Mrs. Pommerenk
 address :
 phone number :

Contacted by, R. Kochy Date Same time Same

Remarks:

"SOT Really noisy right now."

Action taken:

I heard SOT (first time) at my residence (mile away) 2220hr.
 Rig check mon. morning, tripping for bit 9pm - 3am
 10-28 - 10-29

For:

SOT

initiated by R. Kochy
 date 10-29-90

Public Contact Sheet

First Contact: answering service ☐
mobile phone ☒ Direct call
walk-in ☐
other ☐ Specify-

Date 11-1-90 Time 2045

Nature of contact: request for information ☐
complaint call ☒

Residents name: Mrs. Pommerenk
address :
phone number :

Contacted by, R. Kochy Date Same time Same

Remarks:

Mrs. Pommerenk complained of Hydrogen Sulfide odor at her house.

Action taken:

Rig check - all gas sensors working - No alarms -
No indications of any gas.

For: SOH

initiated by R. Kochy
date 11-2-90
0830

Public Contact Sheet

First Contact: answering service ☐ ☒ direct call
mobile phone ☐
walk-in ☐
other ☐ Specify-

Date 11-4-90 time 0930 (approx).

Nature of contact: request for information ☐
complaint call ☒

Residents name: MRS. Pommerenk
address :
phone number :

Contacted by, R. Koehly Date 11-4 time Same

Remarks:

SOT really loud last night -
Resident also complained of vehicle noise.

Action taken:

Time not specified -
Rig check Sat. night. - tripping.

For: SOT

Initiated by R. Koehly
date 11-5-90

Public Contact Sheet

First Contact: answering service
mobile phone
walk-in
other

☐ direct call
☒
☐
☐ Specify-

Date 11-5-90 Time 2:20

Nature of contact: request for information
complaint call

☐
☒

Residents name: Mrs. Pommernik
address :
phone number :

Contacted by: R. Kuby Date 11-5 time Same

Remarks:

Soil really loud.

Action taken:

Checked drill record 11-6 am. - tripping rods.

For:

Soil

initiated by

R. Kubydate 11-6-90

Public Contact Sheet

First Contact: answering service ☒
mobile phone ☐
walk-in ☐
other ☐ Specify-

Date 11-21-90 Time 0438

Nature of contact: request for information ☐
complaint call ☒

Residents name: Mrs. Pommerunk
address :
phone number : 965-8049

Contacted by, _____ Date _____ time _____

Remarks:

Resident informed answering service of "strange smell"
around her house all day yesterday (11-20) and
"worse right now"

Action taken:

Rig check 0930 - no H₂S alarms, no unusual
smells associated with SOH operations.
Tried to call resident 3x. Will follow up...

For: SOH

Initiated by R. Kelly
date 11-21-90

Public Contact Sheet

34

First Contact: answering service ☒ to office phone
mobile phone ☐
walk-in ☐
other ☐ Specify-

Date 11-26-90 Time 3:07 AM

Nature of contact: request for information ☐
complaint call ☒

Residents name: Mrs. Pommerenk
address :
phone number : 905-8049

Contacted by, R. Kechy Date 11-26 time 9 AM

Remarks:

" really noisy last night and night before
last night all night, night before 4 AM "
Request Noise level data.

Action taken:

Rig check 0830 11-26 - Rig on stand by power -
(small welder/generator) drive line problems. Generator
shielded on all sides and covered.

I told Mrs Pommerenk monthly reports submitted to
County - for Noise level data

For:

SOH

initiated by R. Kechy
date 11-26-90

Public Contact Sheet

First Contact: answering service ☐
mobile phone ☒ direct
walk-in ☐
other ☐ Specify-

Date 12-4-90 Time 0730

Nature of contact: request for information ☐
complaint call ☒

Residents name: Greg Pommernik
address :
phone number :

Contacted by: R. Koehn Date 12-4-90 Time 804 Am

Remarks:

Resident complained of SOH noise

Action taken:

Ria call 0800 - operations normal - called
resident, left message 804 Am

For: SOH

initiated by R. Koehn
date 12-5-90

AMBIENT NOISE SURVEY DATA SHEET

POSITION: *SEN*

ENGINEER: Kall

DAY OF WEEK: Mon DATE: 12-1-90 TIME: BEGIN 2105

CAL: BEGIN

JOE NO.

FINISH: 2112

FINISH:

NOTES AND SKETCH:- Crmat / Salt intersection 250 yds ±
Rec'd call mcs. Pommerenk from Salt

SKY: Overcast

WIND: W-? very slight.

dE A L₁₀:

LIMITS, dBA:

Rec'd call Mrs. Pommernick
"generators running"

1st motor sound - steady 37-38 db

2nd motor 2108 - 40db

Wind direction towards Pommers. (From W-SW)

with wind enhancement 42 lb.

Total # Samples	Upper Limit	L_{10}	Lower Limit
50	1st	5th	10th
100	5th	10th	17th
150	8th	15th	23rd
200	12th	20th	29th
250	16th	25th	35th
300	20th	30th	41st
350	25th	35th	47th

sample from the top

[illegible]

NOISE
LEVEL
(dBA)

10

20

30

40

50

NUMBER OF OCCURRENCES

Public Contact Sheet

First Contact: answering service ☐
mobile phone ☒ direct call
walk-in ☐
other ☐ Specify-

Date 12-17-90 Time 9 PM

Nature of contact: request for information ☐
complaint call ☒

Residents name: Mrs. Pommernk
address :
phone number :

Contacted by, R. Kochy Date _____ time _____

Remarks:

"SOH motors really loud"

Action taken:

went by drill rig - took noise level measurements at
end of SOH Road (Ormat entrance, intersection) - See
attached sheet. Rig operations normal - drilling.
Winds from S.W. (towards Pommernk)

For:

SOH

initiated by R. Kochy

date 12-18-90

APPENDIX C

NOISE COMPLAINT ANALYSIS -- SOH 1



RECEIVED

JAN 31 1991

MMTC-OSD

#89-10
January 29, 1991

Hawaii Natural Energy Institute
Look Laboratory
811 Olomehane Street
Honolulu, Hawaii 96813

Attention: Ms. Laura Glenn

Subject: Summary Of Noise Monitoring Efforts From
October 1, 1990 through December 31, 1990

Dear Ms. Glenn:

Our report dated October 12, 1990 provided a summary of noise level data recorded from July 1, 1990 to September 30, 1990. Following is a summary of noise monitoring efforts performed from October 1, 1990 to December 31, 1990.

- A. Overall Noise Monitoring - Table I is a summary of monitoring activities, indicating that environmental noise monitoring has been performed at a total of three locations for a total of about 155 days on-line over a three month period. There are three automated noise monitoring stations (described as "A," "B," and "C,") which are serviced by Alpha-Micro Systems of Hilo. Robert Kochy has also performed one manual noise level survey in response to a specific complaint during this time period.

Unusually large amounts of data were lost during the three month period due to variety of causes such as: 1.) noise data being lost in mail; 2.) cockroaches drying-up chart recorder pens; 3.) chart paper jams; 4.) ants nesting in a sound level meter and apparently causing failure; 5.) malfunctioning equipment and accessories.

- B. Evaluation of Specific Noise Complaints - Table II provides a summary of the evaluations made based on Public Contact Sheets provided to us for this quarter. The report dated July 30, 1990 explained the process used to evaluate noise complaints. From the table, the sound propagation condition can be estimated by noting whether the complainant was downwind, upwind, or in a "transitional" condition (e.g., crosswind).

Figures 1 through 7 are noise level strip chart recordings obtained when complaints were received. In these figures, the noise data from the monitoring station next to the drilling rig is aligned in time with the noise data from the station at the Pommerenks. Two major divisions of the time scale represent 60 minutes, and one small division is 6 minutes. Note that strip chart recording for Complaint Nos. 8, 9, and 10 (of Table II) are not included since noise data were not available.

SOH noise generated during Complaint Nos. 1 and 10 probably did not exceed the geothermal guidelines since only drilling activities were conducted. Previous analyses indicate that tripping activities cause the highest noise levels, and so far no concrete evidence of exceedence exists during tripping or drilling. In addition, Mr. Kochy's field measurement during Complaint No. 10 yielded a result of 37 to 40 dBA at a distance of 250 yards from the SOH site in a direct line towards the Pommerenk residence.

Tripping activities were conducted during Complaint Nos. 8 and 9 and neither the SOH nor Pommerenk noise data are available for these periods. However, the data for Complaint Nos. 2, 5, 6, and 7 involved similar rig activities and meteorological conditions as Complaint Nos. 8 and 9. Inspection of Figures 2, 5, 6, and 7 does not indicate a correlation between tripping noise from the SOH rig data to noise events at the Pommerenks which exceed 45 dBA for more than 2 minutes in a 20 minute period (geothermal guideline). Therefore, it is believed that the guidelines were probably not exceeded during the period of Complaint Nos. 8 and 9, although the tripping activities could have been audible.

Note that Complaint No. 5 was evaluated in depth in a report to Mr. Jerry Haruno of the Department of Health dated November 14, 1991.

Sincerely,



Mike S. Lee

MSL/msl

Enclosures

Table I - Summary of Noise Monitoring Activities from 10/1/90 to 12/31/90

Location	Mon. Sta.	Data Set	Start Date	Stop Date	Days on Line	Remarks
SOH #1	A	25a	9/17	10/1	< 1	Noise data lost in mail, 10/1-15
Loughlin	B	25c	9/26	10/1	< 1	Noise data lost in mail, 10/1-15
Pommerenk	C	26a	10/5	10/8	3	Mon. Station C inoperative until 10/5
Pemmerenk	C	26b	10/8	10/15	7	5 hrs of data lost on 10/8, paper ran out
SOH #1	A	27a	10/15	10/22	6	31 hrs of data lost during 10/16-17, pen dried out
SOH #1	A	27b	10/22	10/26	4	
SOH #1	A	27c	10/26	10/31	3	No data 10/29-31, paper jam
SOH #1	A	27d	10/31	11/2	1	No data 11/1-2, paper jam
SOH #1	A	27e	11/2	11/9	7	
Loughlin	B	27f	10/15	10/31	8	Bad data 10/15-22, bad cable; 12 hrs of data lost during 12/23-24, pen dried
Loughlin	B	27g	10/31	11/2	2	
Loughlin	B	27h	11/2	11/9	7	
Pommerenk	C	27i	10/15	10/24	9	

Table I - Summary of Noise Monitoring Activities from 10/1/90 to 12/31/90

Location	Mon. Sta.	Data Set	Start Date	Stop Date	Days on Line	Remarks
Pommerenk	C	27j	10/26	11/2	7	No data 10/24-26, equipment breakdown
Pommerenk	C	27k	11/2	11/9	7	
SOH #1	A	28a	11/9	11/26	13	No data 11/24-26, paper ran out
SOH #1	A	28b	11/26	11/30	0	No data, paper jam
Loughlin	B	28c	11/9	11/30	21	10 hrs of data lost, paper jam
Pommerenk	C	28d	11/9	11/30	9	No data 11/11-16, 11/19-21, 11/26-28, paper jam; intermittent jams 11/16-30
SOH #1	A	29a	11/30	12/14	8	12-hrs of data lost during 11/3-12/3, pen dried; no data 12/3-7, 12/11-12, pen dried
Loughlin	B	29b	11/30	12/7	5	No data 12/1-3, pen dried; 9 hrs of data lost on 12/5, pen dried; SLM taken to Sta. A; Sta. B off-line
Pommerenk	C	29c	11/30	12/14	9	56 hrs of data lost 12/2-5, weak battery; no data 12/8-10, pen dried

Table I - Summary of Noise Monitoring Activities from 10/1/90 to 12/31/90

Location	Mon. Sta.	Data Set	Start Date	Stop Date	Days on Line	Remarks
SOH #1	A *	30a	12/14	12/24	2	No data 12/14-19, pen dried;rig shut down 12/22
Pommerenk	C	30b	12/14	12/26	11	No data 12/25-26, paper jam
Pommerenk	C	30c	12/26	12/31	4	No data 12/30-31, weak battery

* -- Sound level meter from the monitoring station B is used.

TABLE II - SUMMARY OF NOISE COMPLAINTS FROM SOH #1 AND EVALUATIONS; OCTOBER THROUGH DECEMBER, 1990

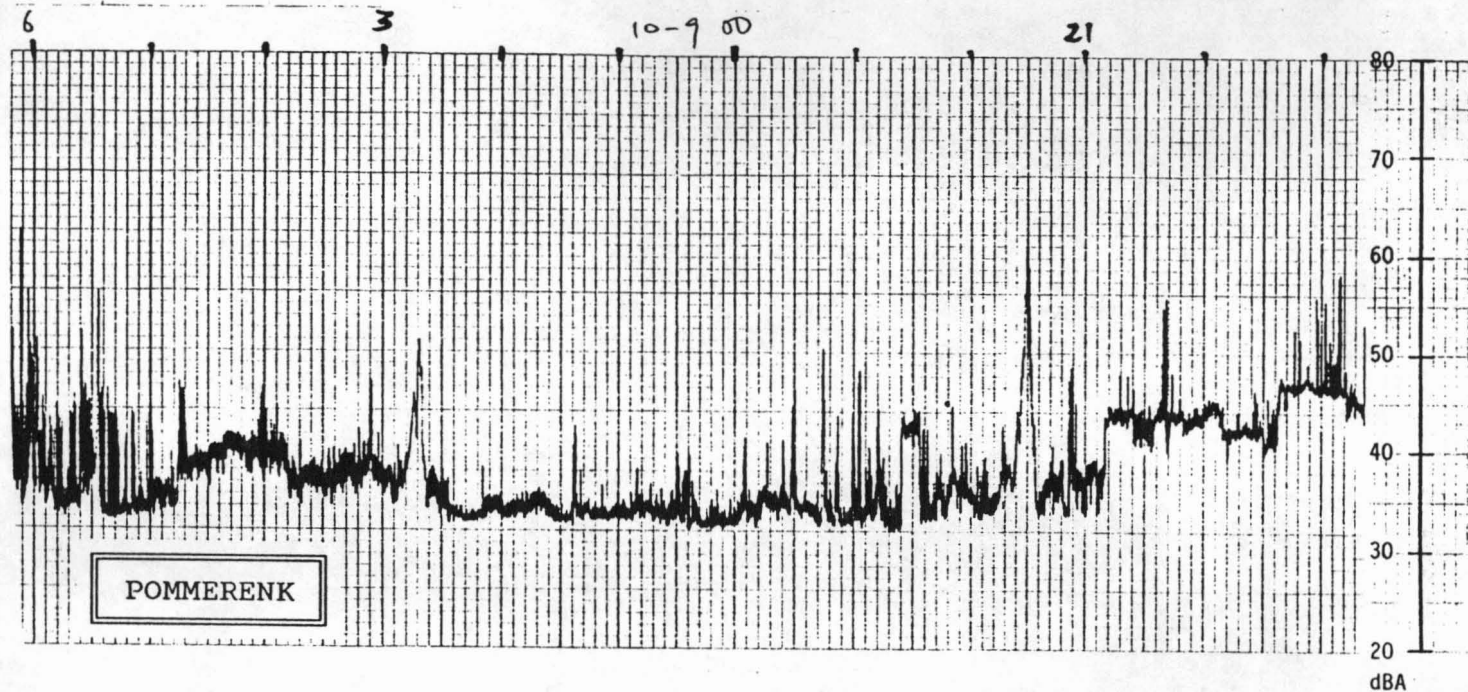
No.	Date (Time)	Complainant	Complainant's Comment	Rig Operation	Rig Noise Level	Met Condition	Comments & Evaluation
1	10/9/90 (0640)	A. Sarhanis	SOH noise wakes him at night	Drilling	No data available	Mostly downwind 2-4 mph	Cannot evaluate due to lack of SOH noise data. See text.
2	10/16/90 (1630)	D. Muller	Had to get up at 3 am; heard machinery noise, did not know where it was coming from	Drilling & tripping	Transients of up to 65 to 67 dBA around midnight; less than 60 dBA after 1 am	Downwind 2-3 mph	No exceedences during the time of complaint (3 am); one long noisy event recorded at Pommerenk around 3 am is not an SOH-related event.
3	10/22/90 (0615)	D. Pommerenk	"SOH drilling operation really loud last night"	Drilling & tripping	many transients greater than 80 dBA	Condition varies from station to station; downwind to upwind	Predictably audible; data @ Pommerenk seems bad; probably no violation due to temporal aspect.
4	10/27/90 (0900)	D. Pommerenk	"SOH really loud last night"	Tripping	intermittent steady levels of 56 to 60 dBA few transients of up to 75 dBA	Primarily downwind 2-7 mph	Transients recorded @ Pommerenk during the early morning hrs., predictably audible; probably no violation due to temporal aspect.
5	10/28/90 (2235)	D. Pommerenk	"SOH really noisy right now"	Drilling & tripping	Many transients from 65 to 80 dBA	Downwind 3-6 mph	Transients recorded @ Pommerenk during the time of complaint, predictably audible; probably no violation due to temporal aspect.
6	11/4/90 (0930)	D. Pommerenk	"SOH really loud last night"; vehicle noise complaint	Tripping	Many transients typically from 65 to 75 dBA; few were above 80 dBA	Downwind 2-3 mph	Many transients recorded @ Pommerenk, predictably audible, probably no violation due to temporal aspect; "vehicle noise" is not related to SOH; this complaint was analyzed in detail to respond to DOH.
7	11/5/90 (2200)	D. Pommerenk	"SOH really loud"	Tripping	Many transients from 65 to 75 dBA	Downwind 2-4 mph	Predictably audible, probably no violation due to temporal aspect.
8	11/26/90 (0307)	D. Pommerenk	"Really noisy last night and night before, last night all night, night before 4 am"; request noise level data	Drilling & tripping	No data available	Downwind 2-5 mph	Cannot evaluate due to lack of SOH and Pommerenk noise data. See text.
9.	12/4/90 (0730)	G. Pommerenk	Resident complained of SOH noise	Tripping	No data available	Downwind 2-3 mph	Cannot evaluate due to lack of SOH and Pommerenk noise data. See text.
10.	12/17/90 (2100)	D. Pommerenk	"SOH motors really loud"; "generators running"	Drilling	No data available	Condition varies from station to station, downwind to upwind	Kochy: measured "motor sound" of 37 to 40 dBA @ Ormat/SOH intersection (250 yds from SOH); no exceedences likley.



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FIGURE 1. STRIP CHART RECORDING FOR
COMPLAINT No. 1



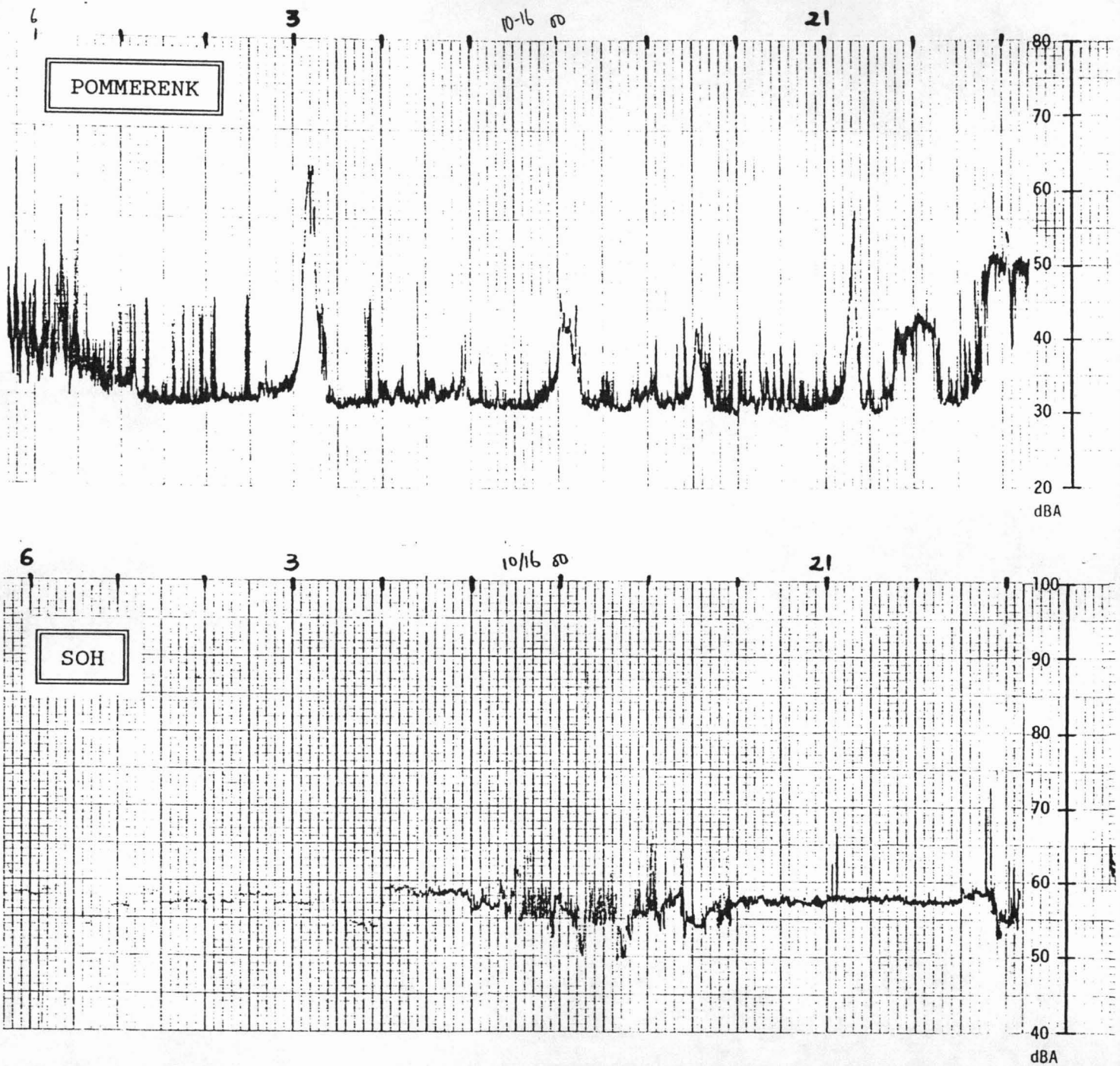
NO RIG NOISE
DATA AVAILABLE



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FIGURE 2. STRIP CHART RECORDING FOR
COMPLAINT NO. 2



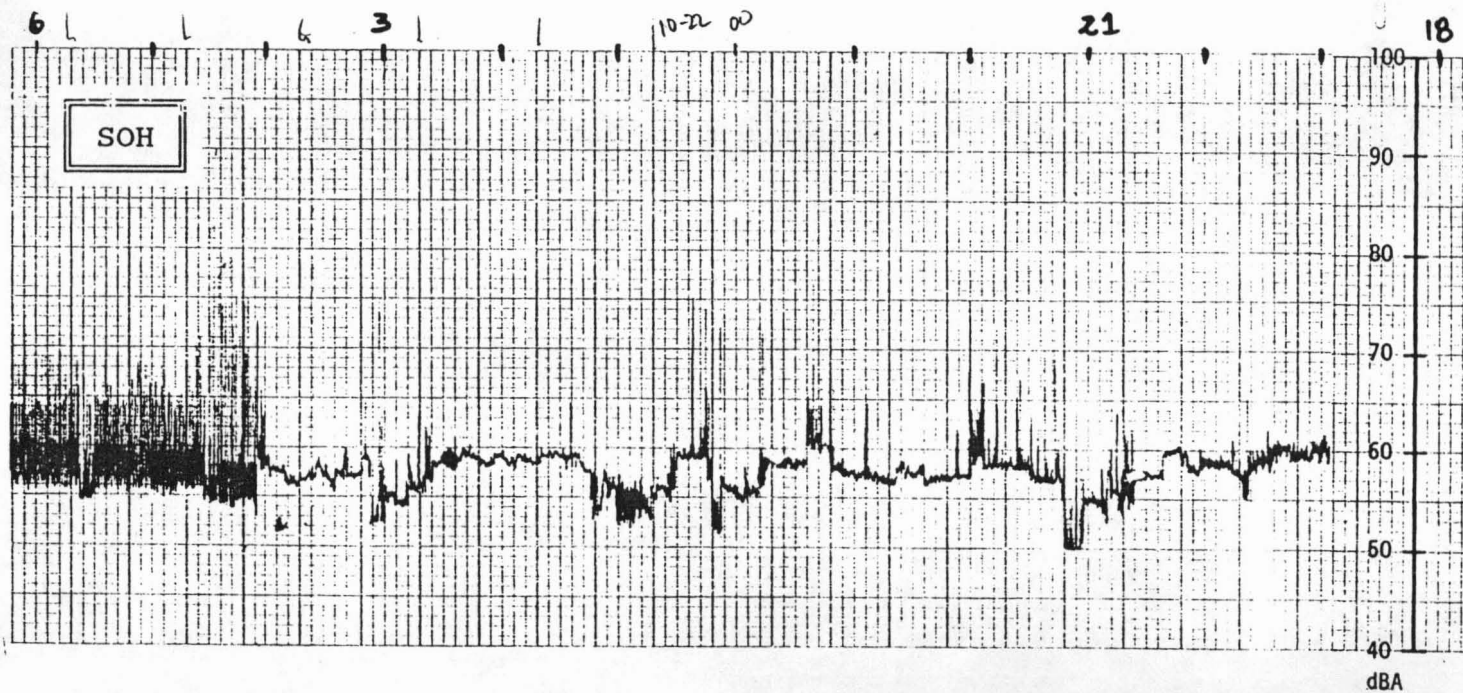


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NO POMMERENK NOISE
DATA AVAILABLE

FIGURE 3. STRIP CHART RECORDING FOR
COMPLAINT No. 3

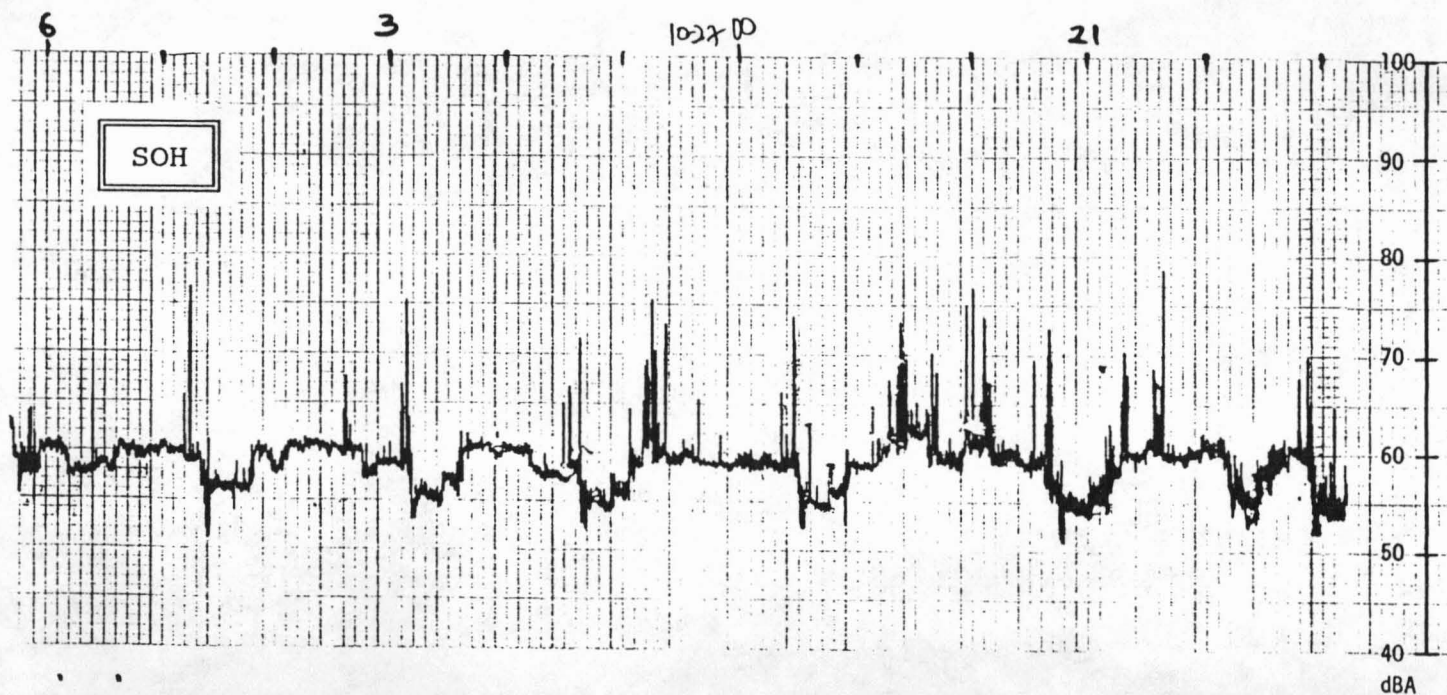
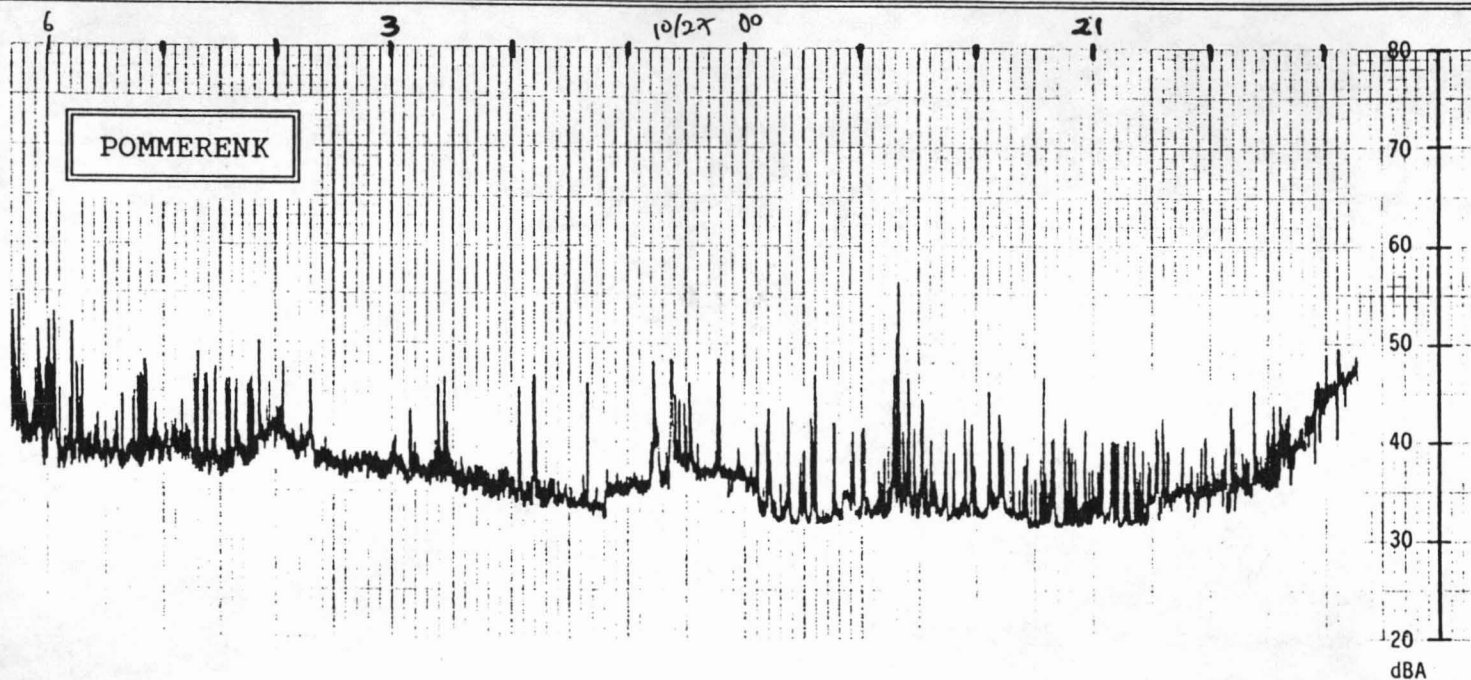




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FIGURE 4. STRIP CHART RECORDING FOR
COMPLAINT No. 4

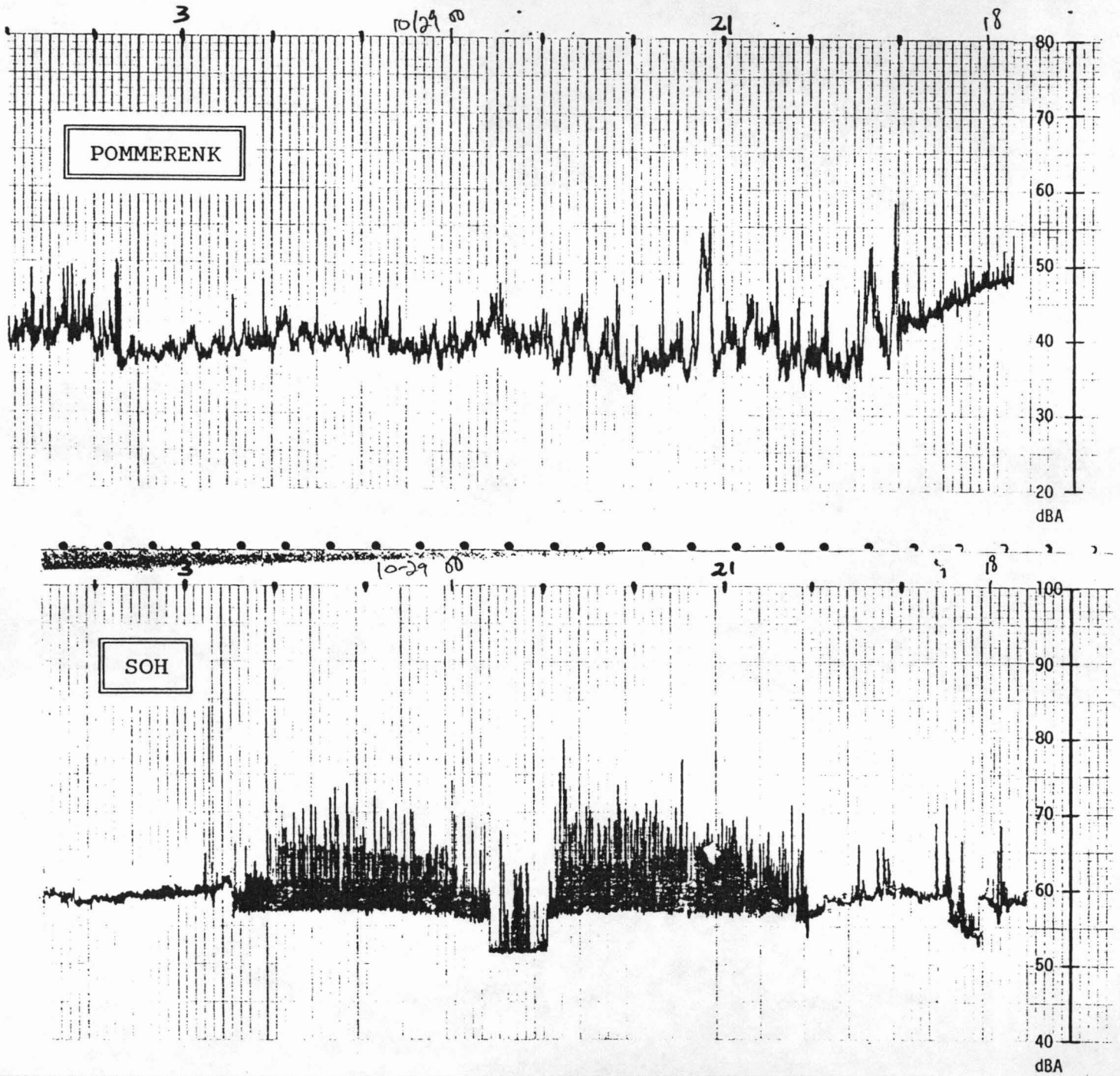




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FIGURE 5. STRIP CHART RECORDING FOR
COMPLAINT NO. 5

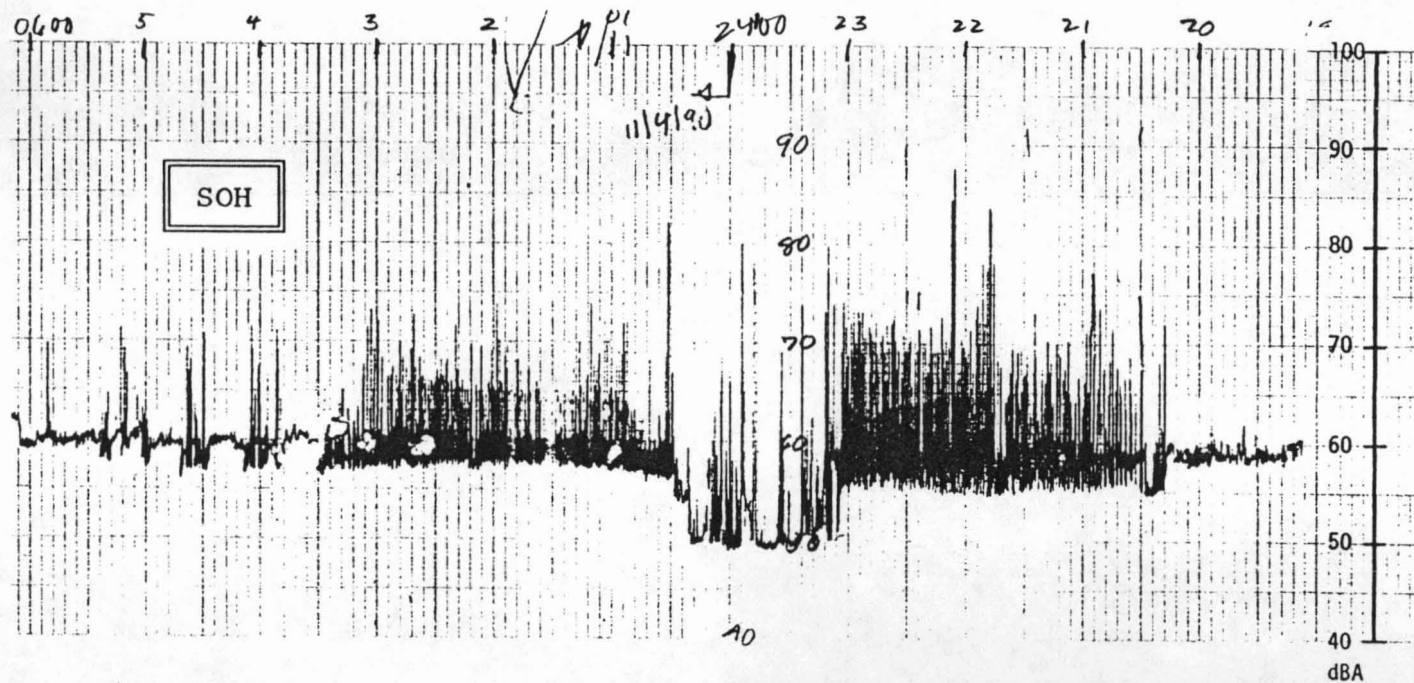
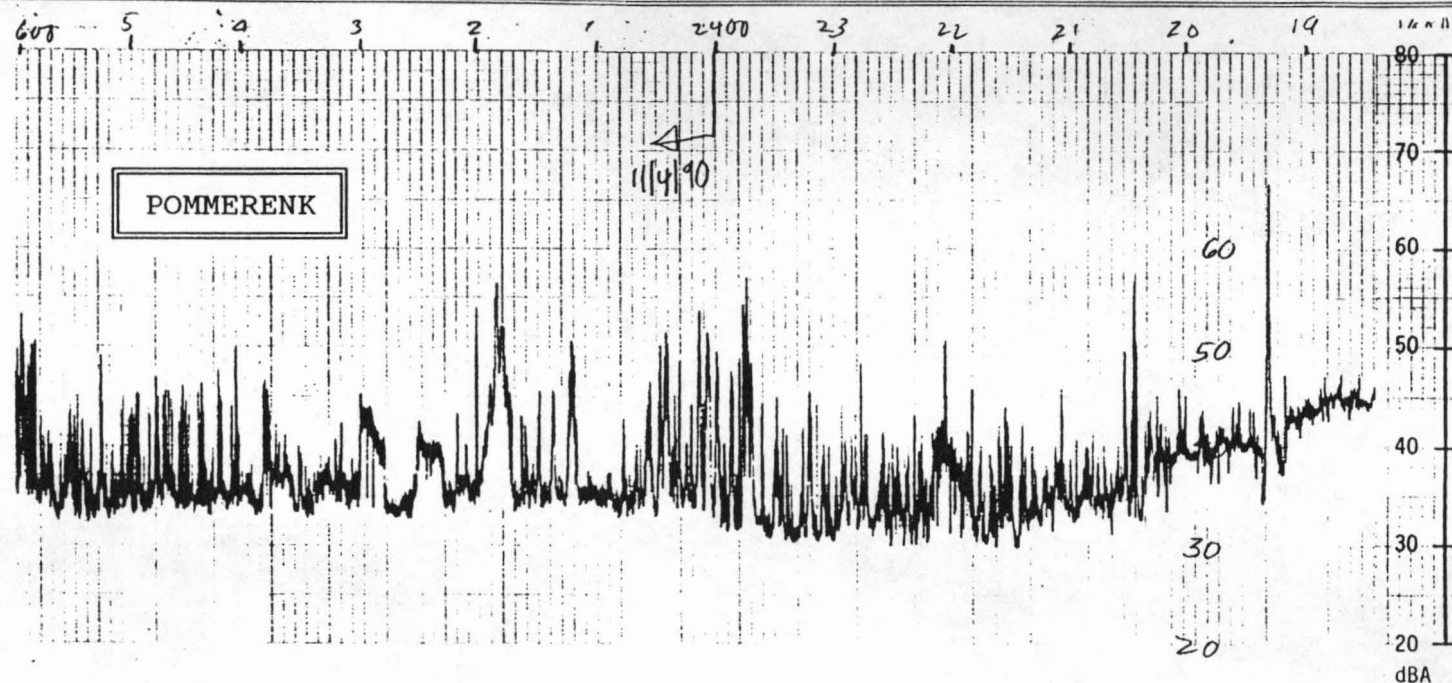




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FIGURE 6. STRIP CHART RECORDING FOR
COMPLAINT NO. 6

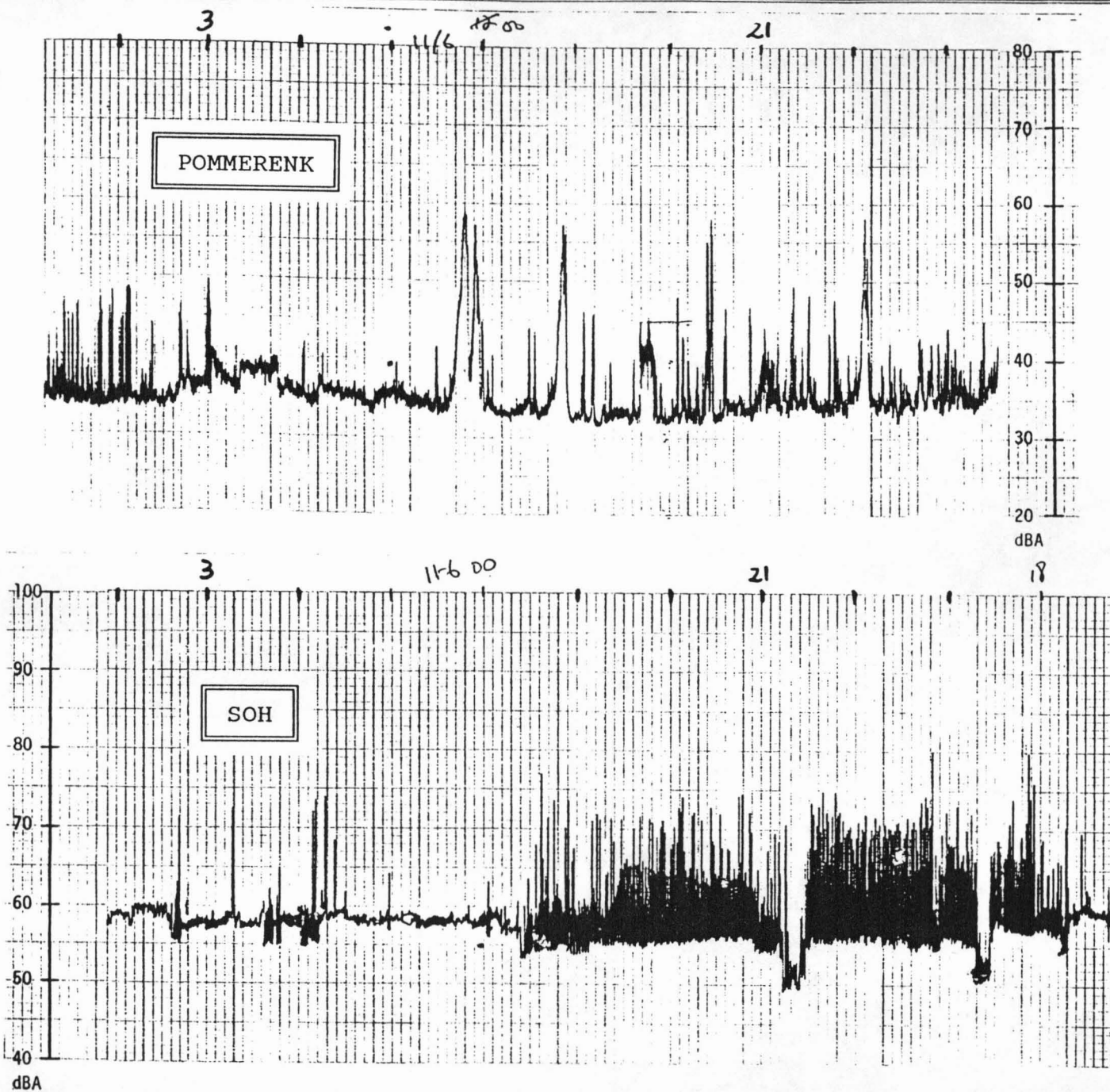




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FIGURE 7. STRIP CHART RECORDING FOR
COMPLAINT No. 7



APPENDIX D
FINANCIAL REPORT

DBED \$3,000,000

AGREEMENT FOR A GEOTHERMAL RESOURCE DEVELOPMENT, HAWAII (RCUH 3908-00)

BUDGET CATEGORY	AMOUNT AWARDED	AMOUNT EXPENDED AS OF 12/27/90	AMOUNT ENCUMBERED	AVAILABLE BALANCE
Salaries	\$77,500.00	\$70,921.03	\$0.00	\$ 6,578.97
Fringe	\$20,000.00	\$8,717.84	\$0.00	\$11,282.16
Equipment	\$165,000.00	\$114,169.92	\$59,549.22	-\$ 8,719.14
Supplies	\$350,500.00	\$465,739.01	\$15,928.24	-\$131,167.25
Travel	\$25,000.00	\$28,563.77	\$2,589.20	-\$6,152.97
Consultant	\$195,000.00	\$300,565.98	\$44,441.17	-\$150,007.15
Publications	\$0.00	\$0.00	\$0.00	\$0.00
Miscellaneous	\$142,000.00	\$225,568.20	\$18,495.32	-\$102,063.52
Indirect Costs	\$25,000.00	\$25,000.00	\$0.00	\$0.00
Drilling	\$2,000,000.00	\$2,138,205.73	\$101,843.94	-\$240,049.67
TOTAL	\$3,000,000	\$3,377,451.48	\$242,847.09	-\$620,298.57

